DRAFT

BAY AREA '91 CLEAN AIR PLAN (CAP):

Implementing All "Feasible" Controls

April 1991

Association of Bay Area Governments

Bay Area Air Quality Management District

Metropolitan Transportation Commission

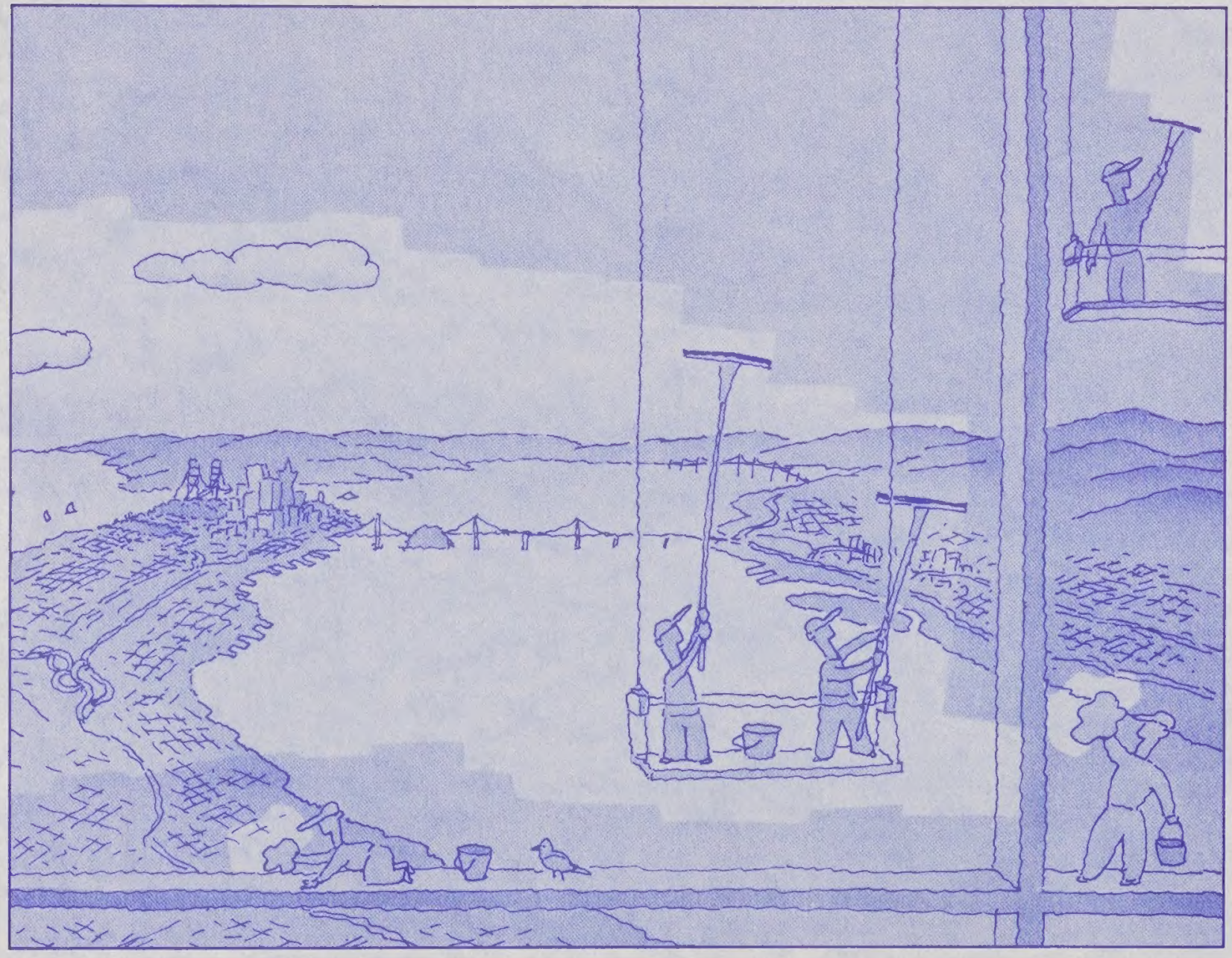

Illustration by Jack Desrocher

"Air quality improvements require participation of all the region's residents . . . the measures contained in this plan will affect us all."

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BAY AREA AIR QUALITY PLANNING JARGON

'91 CAP	1991 Clean Air Plan
ABAG	Association of Bay Area Governments
BAAQMD	Bay Area Air Quality Management District
CARB	California Air Resources Board
CCAA	California Clean Air Act
CO	Carbon monoxide
HC	Hydrocarbons
I & M	Inspection and Maintenance (or "Smog Check" program)
MTC	Metropolitan Transportation Commission
NOx	Nitrogen oxides or oxides of nitrogen
PM-10	Particulate matter less then 10 microns
pphm	Parts per hundred million
ppm	Parts per million
RHC	Reactive hydrocarbons
SIP	State Implementation Plan (to meet federal requirements)
TCM	Transportation control measure
VMT	Vehicle miles traveled

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Implementing All "Feasible" Controls

SUMMARY

For more than two decades, a national and State commitment to clean up the air has been underway. We have made much progress; however, more remains to be done. At different times of the year in different parts of the Bay Area, the air we breathe is unhealthy. This is especially true for the young, elderly and people with breathing problems. Air pollution also damages agricultural crops, plants and materials. Federal and State standards have been established for a variety of different air pollutants. These standards are set at levels to protect the public's health.

"Everyone shares responsibility for cleaning up the air."

Federal law and, more recently, California law require every region to have a plan showing how clean, healthy air will be achieved. The Bay Area does not always meet healthy air quality standards for ozone and carbon monoxide. A plan to remedy this is required by June 30, 1991. This report describes the Bay Area's plan for meeting the State clean air laws. We have called it the **Bay Area '91 Clean Air Plan (CAP)** or **'91 CAP** for short. This plan seeks to reduce ozone near the ground, where it is harmful to people, plants, and materials. It does not affect ozone in the stratosphere, where it is needed to protect us from excessive ultraviolet radiation.

Everyone shares responsibility for cleaning up the air--industry, business, government, and you. Over the past twenty years, many steps have been taken to improve the air we breathe; indeed these actions have made the air much cleaner. The easy actions have already been taken; the difficult challenge lies before us.

Industry is more tightly controlled than ever--but it can and will have to do more as a result of the **'91 CAP**. The cars we drive today are 90% cleaner than they were twenty years ago--but they are not yet clean enough. Our population keeps growing, buying more cars, and driving far more than our rate of population growth. As part of the **'91 CAP**, tomorrow's cars and trucks will be much cleaner than the ones we are now driving. They need to be inspected more rigorously and on a more frequent schedule. More and more they will use cleaner fuels such as methanol, natural gas, propane, or electricity. And, no matter how clean the cars are, we will have to drive less in order to maintain clean air, mobility, and quality of life.

We will all need to examine how our actions may contribute to the problem. Local governments will need to examine more closely how zoning decisions affect jobs, housing and transportation patterns. Lastly, the Bay Area's populace needs to renew its environmental ethic. We will have to consider changes in how we travel, products we buy, and household practices. Multiplied millions of times throughout the region, small individual changes can produce a major improvement in the air we all breathe. If we care, collectively, we can make a difference.

The carbon monoxide standard which is currently violated at several locations of the Bay Area is projected to be met throughout the region by the mid-90s. However, the analysis in this Plan shows that, even if all the programs presented are fully carried out, the region will **not** meet the State ozone standard during this century. The plan recommends doing everything "feasible" as quickly as possible. Such actions will reduce the frequency and magnitude of air quality violations in the years to come, reduce population exposure to unhealthy air, and lead to the earliest possible attainment of healthy air.

The actions called for in the **'91 CAP** have both supporters and opponents. Many proposals will be controversial. Supporters

advocate meeting the law, progressive environmental changes and reducing the direct and indirect costs of air pollution to society. Opponents express concerns over the impacts on the region's economy and interference with individual life styles and freedoms. They also question whether the benefits are worth the costs.

Estimating the **'91 CAP** costs and benefits is difficult. Projecting direct economic cost, while challenging, is usually the easiest task. Forecasting indirect economic cost becomes more difficult because of uncertainties in the secondary changes resulting from higher costs for business and industry. Often new industries and jobs are created as the result of new regulations; this may somewhat offset the economic costs of new controls. As required by law, actions in the plan are assessed for their cost-effectiveness.

Quantifying the economic benefits is the most difficult task. Benefits include reduced medical costs, fewer sick days for sensitive population groups, travel time savings, and less crop and materials damage. The law does not require a detailed assessment of these benefits. It only requires that an area's plan insures steady improvement and progress towards clean, healthy air for all.

The pages that follow describe a clean air vision for the Bay Area--continuous, clear, healthy air quality for the region's growing populace. Carrying out the strategies in the **'91 CAP** will produce these results. An important part of the **'91 CAP** is effectively communicating the actions necessary to accomplish its goals. It cannot be done by business and industry alone, nor by government at different levels. Clean air will come to the Bay Area when we all commit to doing our part.

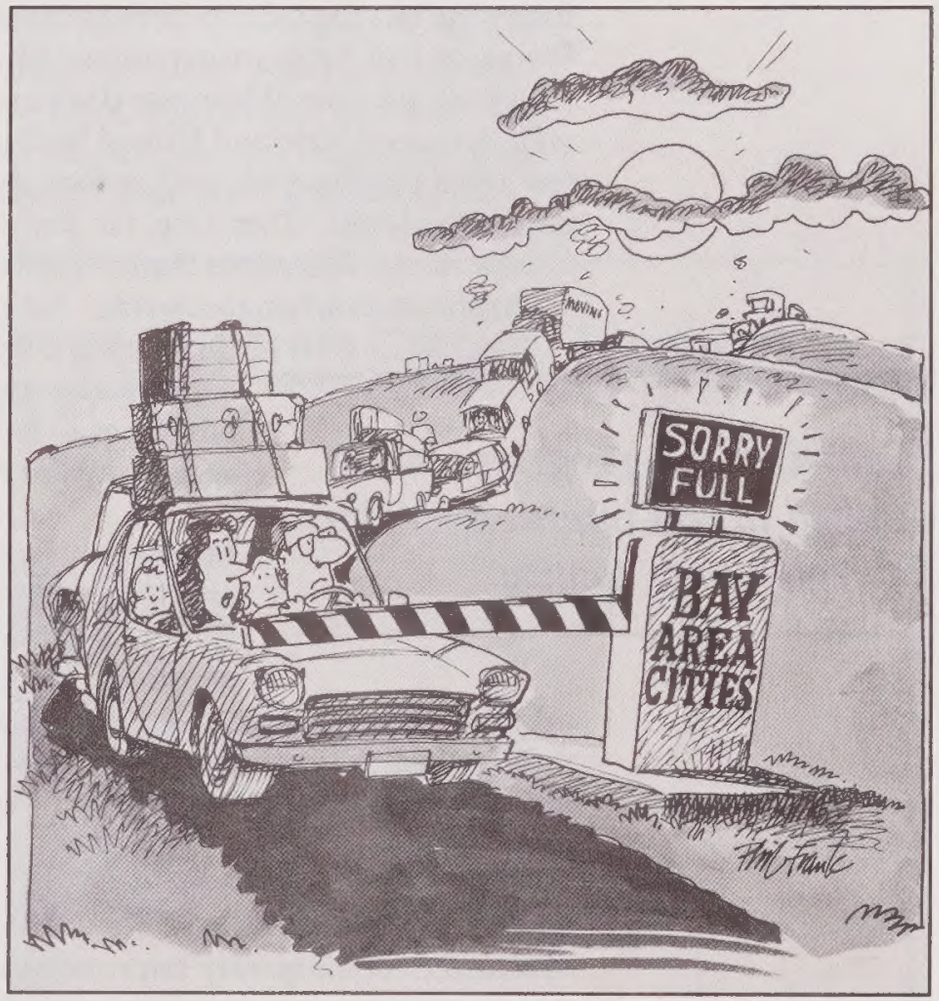


Illustration by Phil Frank

"The easy actions have already been taken; the difficult challenge lies before us."

WHY AN AIR QUALITY PLAN IS NEEDED

Everyone has the right to breathe clean, healthy air. In the San Francisco Bay Area, we experience clean air most of the time. However, on several summer days each year ozone levels in inland valleys exceed State and federal health standards. Similarly, on a few winter nights each year, carbon monoxide (CO) levels reach unhealthy levels. Therefore, the Bay Area is designated by the California Air Resources Board (CARB) as a "nonattainment area" for ozone and carbon monoxide. Air quality standards are set by the State to protect public health. The goal of air quality planning is to reduce pollutant emissions to levels where these standards will always be met.

"Combined . . . programs have resulted in real improvements in the region's air quality."

More than twenty years ago, Congress enacted and the President signed the 1970 Clean Air Act into law, establishing **national** air quality standards and timetables for meeting these standards. The standards were set to protect the public's health. Regions that violated these standards were required to prepare a plan showing how the standards would be met.

Such a plan was prepared for the Bay Area in the early 1970s, and as a result our air quality improved. In retrospect, the standards and timetables set in the 1970 federal law were too ambitious for most of the country. Realizing this, the Clean Air Act of 1970 was amended in 1977. The deadlines were extended and new plans required. Depending on the severity of an area's air quality problems, the 1977 law allowed an additional ten years to meet these standards, or until December, 1987.

In 1982, the Bay Area completed a major revision to its early air quality plan. This plan became the blueprint for many control

Table 1 • Ozone Air Quality (1986-88)
15 Largest Metropolitan Areas

Metropolitan Area	Population (Millions)	# Violations*
New York/New Jersey/Connecticut	18.0	18.0
Los Angeles	13.1	145.0
Chicago	8.1	21.2
San Francisco/Oakland/San Jose	**5.9**	**3.4**
Philadelphia	5.8	8.9
Detroit	4.6	3.3
Boston	4.1	10.0
Dallas-Ft. Worth	3.7	5.8
Houston-Galvaston	3.6	12.6
Washington, D.C./Maryland/Virginia	3.6	8.3
Miami/Ft. Lauderdale	2.9	2.1
Cleveland/Akron	2.8	5.8
Atlanta	2.6	10.2
St. Louis	2.4	7.5
Pittsburgh	2.3	6.6

* Average number of days per year when 1 hour ozone levels are above federal standard (0.12 ppm)

Source: U.S. Environmental Protection Agency (1989)

programs carried out during the '80s. For example, among other measures the 1982 plan included:

- Dozens of new or stricter controls on Bay Area industry and business;
- Automobile inspection and maintenance or I & M (the "Smog Check") program; and
- Transportation control measures (TCMs) to reduce private auto use and to encourage transit, carpools, vanpools and other commute alternatives.

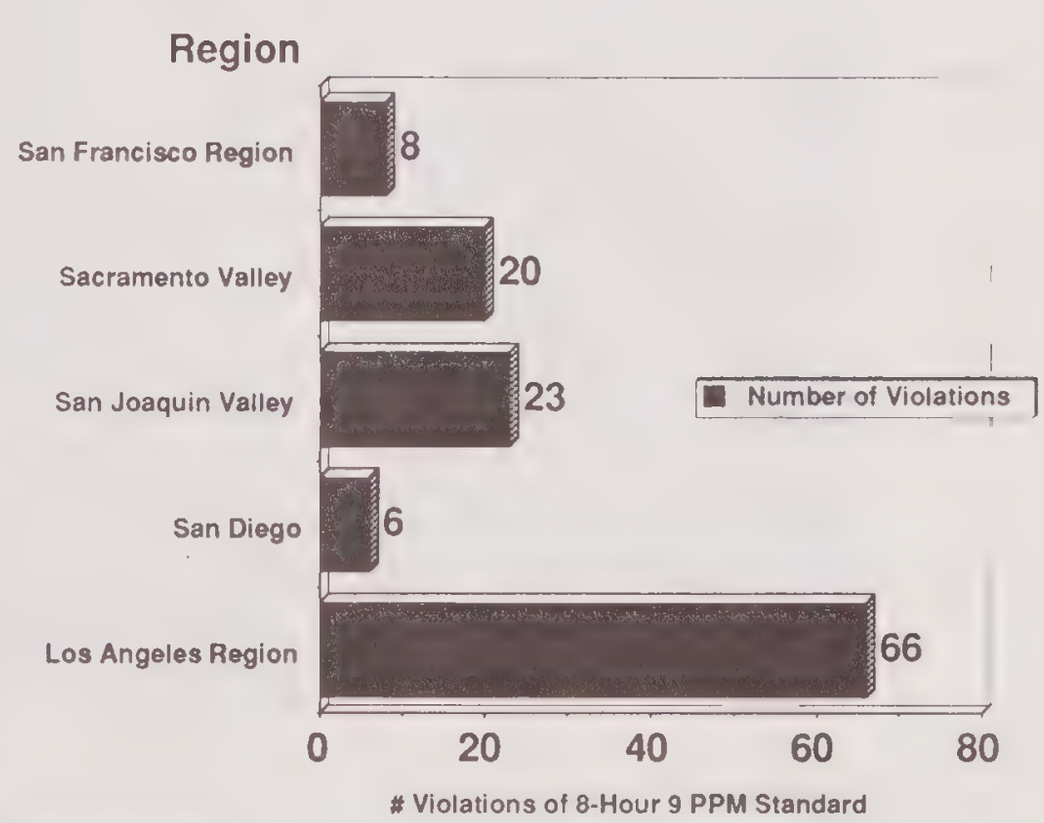
Combined, the above programs have produced real improvements in the region's air quality. However, even with all these controls, air quality standards are still being violated.

By the end of 1987, another deadline had passed. Despite major improvements, the region still violated the federal standards. This was equally true in most major metropolitan areas. Nationwide, 96 areas still exceed the national ozone standard and 41 exceed the CO standard. Table 1 shows how the fifteen largest metropolitan areas across the country fared in meeting the law. Using the federal **ozone** standard the Bay Area is the third "cleanest" among the fifteen. This standard is the most difficult in the country to meet. So far, only a few urbanized areas of the country have met the standard--none are in California.

Figure 1 presents comparative information for **CO** violations in several California regions. Although the Bay Area continues to violate the standard, only the San Diego area has fewer violations. As the second most populous region of the State, the Bay Area's frequency of violations is relatively modest.

Federal requirements lapsed in 1987, and as 1988 began, the lack of federal direction became increasingly obvious. Many areas of the country still exceeded standards. Yet, Congress was unable to revise and update the 1977 Clean Air Act. Amidst this background of federal uncertainty, the **California Clean Air Act** (CCAA) was

Figure 1 • Violations of California Carbon Monoxide Standard in 1989



Source: CARB, BAAQMD (1990)

enacted. In many respects this law is similar to the federal law, and in many other ways it is different.

". . . air quality standards are still being violated."

This CCAA is the primary impetus for the current **'91 CAP**. It is a very ambitious and comprehensive law. It calls for meeting California air quality standards and establishes rates of progress toward the goal. Each nonattainment area must submit detailed plans to the State showing new control programs and schedules for their implementation. Plans are due June 30, 1991.

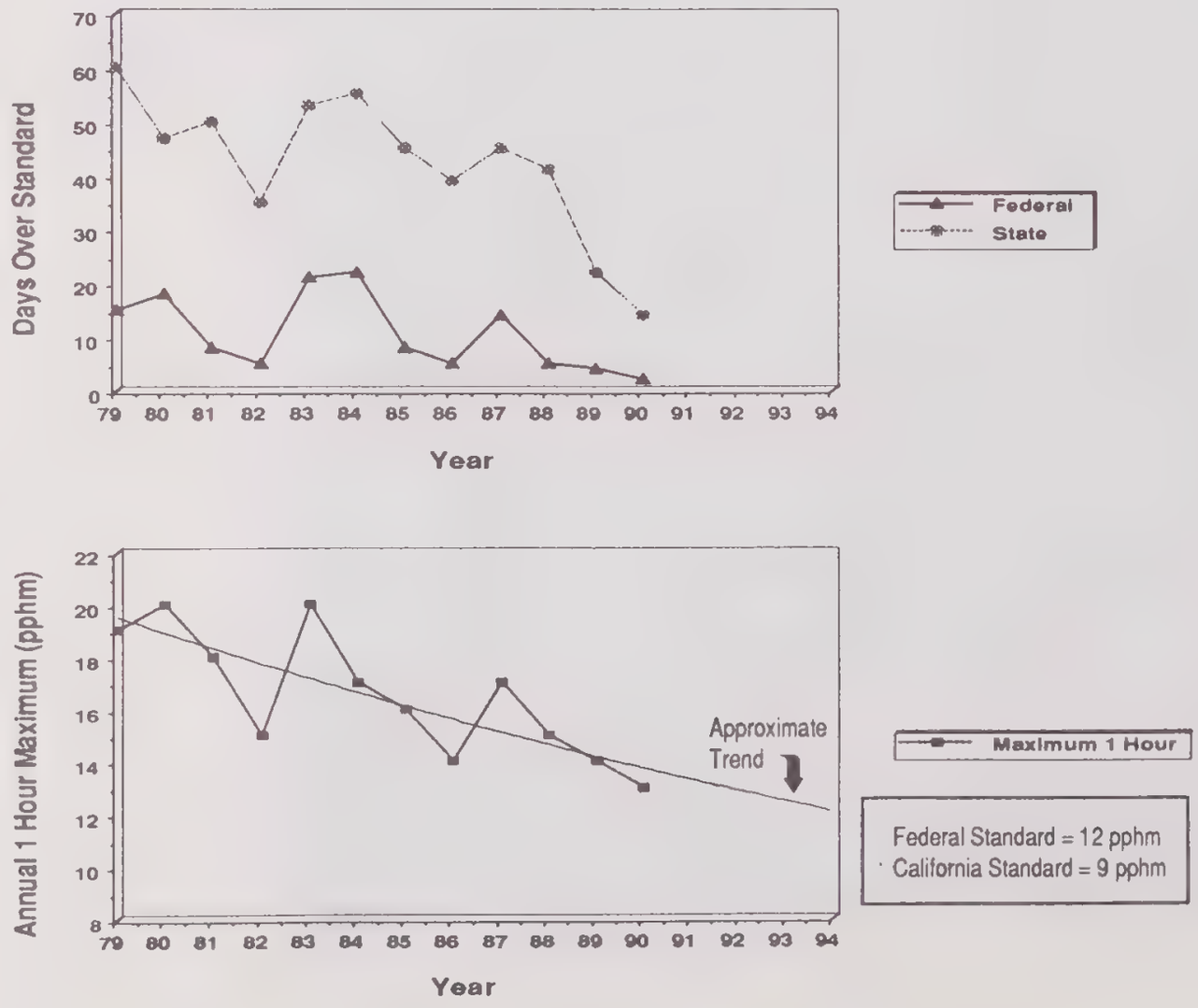
Both federal and California air quality standards are set to protect public health. They differ in the "margin of safety" assumed in defining these levels of protection. The CCAA requires meeting California air quality standards; the federal Clean Air Act mandates attaining national air quality standards. California air quality standards are more stringent than federal standards; therefore, it is likely that any plan meeting California requirements will also satisfy the revised federal Clean Air Act. **The '91 CAP is prepared to satisfy the California law.**

At the end of 1990, Congress passed and President Bush signed the **1990 Clean Air Act Amendments**, revising the **federal** law. The new federal law is about 800 pages long and very complex. It requires EPA to provide guidance on many matters, including updating federal air quality plans.

It will be some time until this guidance is available and used to update the Bay Area's federal air quality plan. Each law has unique planning requirements. Many actions taken in this **'91 CAP** will satisfy federal requirements, although some additional actions may be necessary. The Bay Area plan to satisfy the federal planning requirements will be the documented at a future date in a separate report.

THE BAY AREA'S AIR QUALITY TODAY

Figure 2 • Bay Area Ozone Trends (1979-90)



Source: BAAQMD (1991)

Air pollution is a complex phenomenon. It involves sources emitting different contaminants throughout the day distributed over the region. It is affected by the weather--sunlight, temperature, winds, cloud cover--and the geography of the Bay Area. Also, pollutants emitted in one place can react to form different contaminants downwind in other areas later in the day.

In most instances our eyes and noses are unable to detect air pollution because many forms of air pollution are colorless and odorless. And air pollution that we can see, while unsightly, may not violate standards or pose a health threat. Because of this, our perceptions of air quality are often wrong. Recent surveys show that many Bay Area residents perceive air pollution levels as worsening. In fact, air quality has improved steadily over the past twenty years.

The BAAQMD takes air quality measurements continuously throughout the region at about thirty locations. Most monitoring stations measure a variety of pollutants, while other stations measure only one or two pollutants. These stations provide current and historic data on the region's air quality. From these data we see if the air is getting cleaner or more polluted; over time it also shows where changes are taking place. Figures 2 and 3 show some important trends experienced in the Bay Area since the late '70s.

Ozone builds up on hot, windless summer days. It results from the chemical reactions of reactive hydrocarbons (RHC) and nitrogen oxides (NOx) in the presence of sunlight. The number of Bay Area violations of the California 1-hour ozone standard of 9 parts per hundred million (pphm) declined from about 50 violations per year during the early '80s to around 20 violations per year during the late '80s (Figure 2). Similarly, the year's highest reading has decreased from about 20 pphm to around 13-15 pphm. Thus, both

the frequency and magnitude of ozone violations have declined significantly during the past decade. These improvements follow similar improvements during the late '60s and throughout the decade of the '70s. Ozone air quality has improved throughout the Bay Area over the last 20 years.

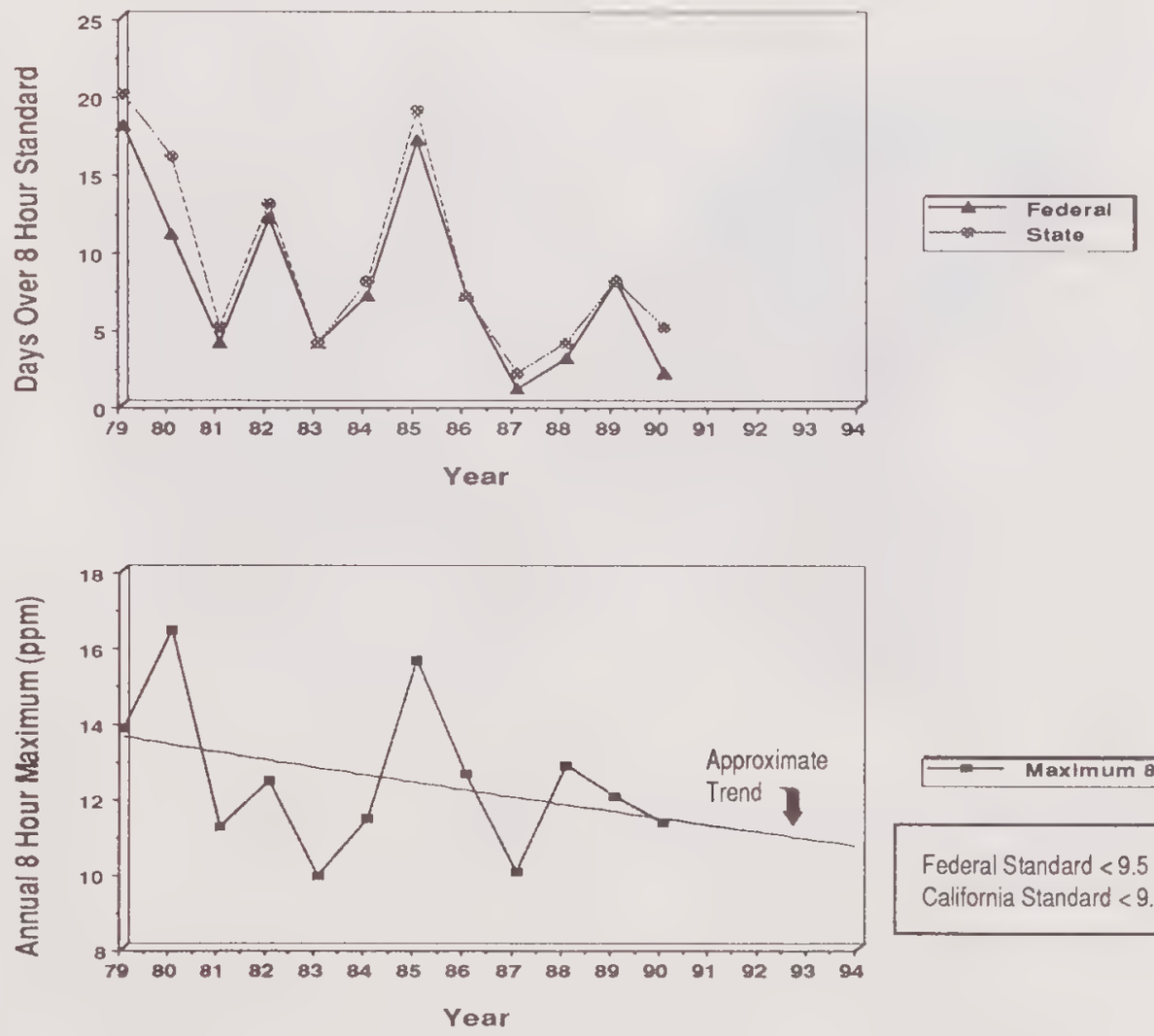
The California 8-hour CO standard is 9 parts per million (ppm). CO violations have also decreased throughout the Bay Area over the last 20 years. Figure 3 summarizes the CO monitoring data since 1979. Unlike ozone pollution, which forms in the atmosphere miles away from the emission sources, CO is emitted directly. Motor vehicles are the major source of CO emissions. Problems often occur in heavily congested areas; in the Bay Area, CO violations occur in San Francisco, San Jose and the City of Vallejo.

The improvements in CO levels have closely paralleled the introduction of cleaner cars into the region's vehicle fleet. Another important factor in lowered CO levels is the "Smog Check" or vehicle inspection and maintenance (I & M) program. During the '80s, CO levels improved steadily in the region despite increases in travel and congestion; the improvements in technology have **more** than offset increases in travel and slower speeds. These trends should continue through the decade of the '90s as well.

During the early '80s, CO violations occurred up to 20 times a year, depending primarily on meteorological factors. These violations decreased in the late '80s to around 5-10 times a year. As in the case with ozone, both the number and magnitude of CO violations have gone down during the last twenty years.

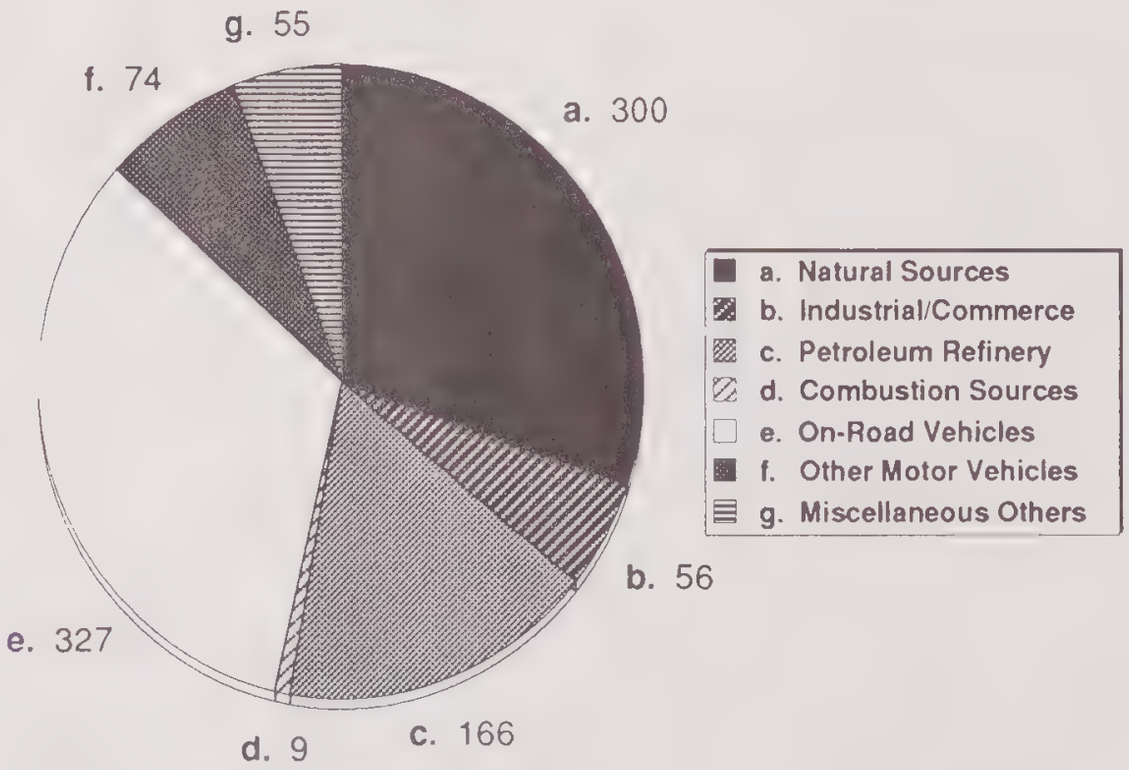
Ambient air pollution levels are the result of emission patterns and weather conditions. Figures 4 and 5 summarize the 1987 baseyear historical levels of emissions in the region for different air contami-

Figure 3 • Bay Area Carbon Monoxide Trends (1979-90)

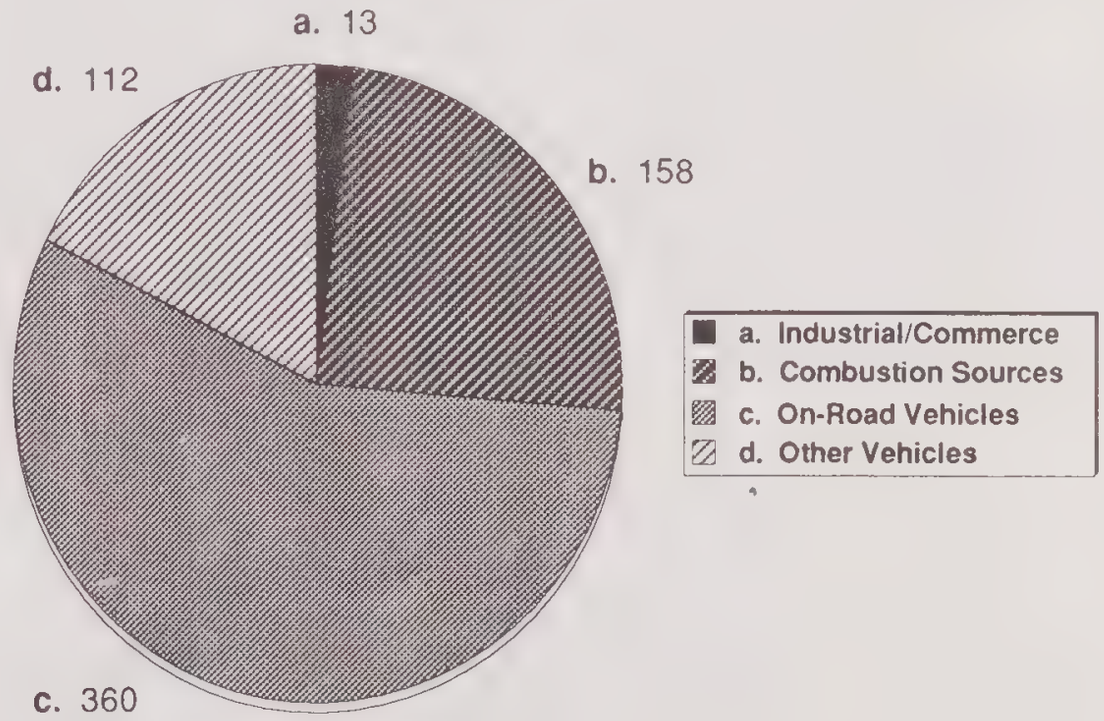


Source: BAAQMD (1991)

Figure 4 • 1987 Emissions of Ozone Precursors: Reactive Hydrocarbons and Oxides of Nitrogen



Reactive Hydrocarbons
987 Tons/Day



Oxides of Nitrogen
644 Tons/Day

Source: BAAQMD (1991)

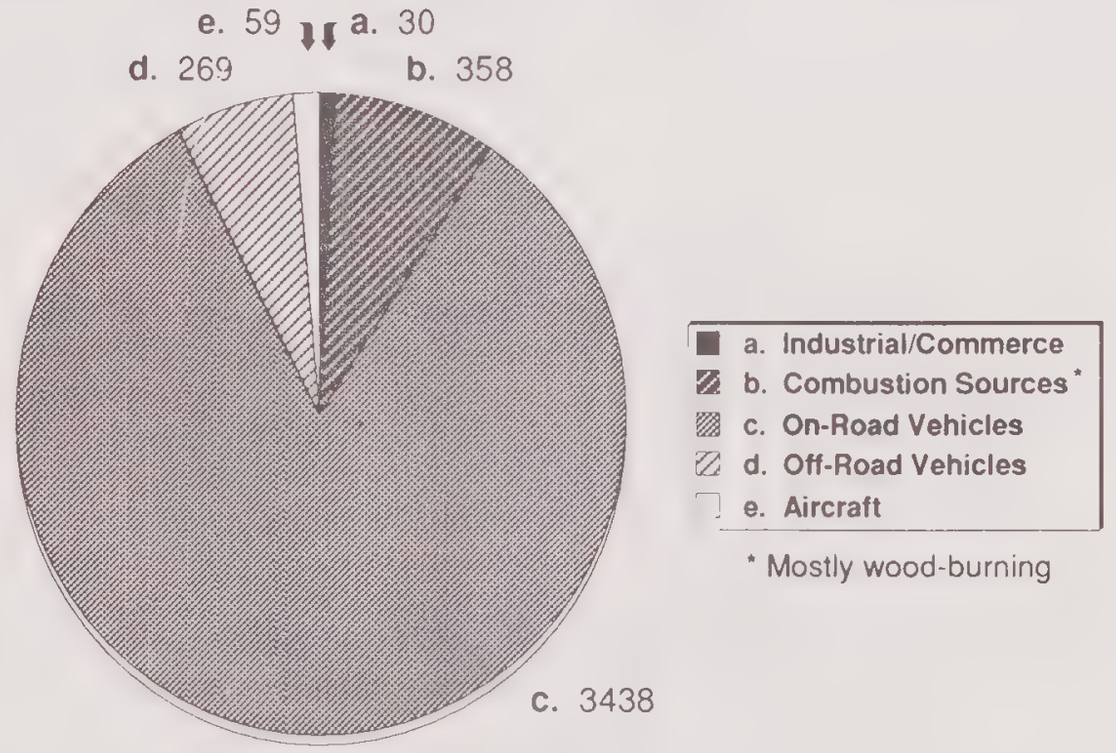
"Our perceptions of air quality are often wrong . . . air quality has improved steadily over the past twenty years."

nants. These data are the basis for devising additional control programs to further improve air quality levels. The CCAA specifies the year 1987 as the starting point for developing and estimating control strategy improvements.

There are millions of sources of air pollution, both natural and man-made. In the Bay Area, emissions from urban activities significantly exceed natural sources of air pollution. Emission sources are widespread in number and types throughout the region. They emit at different times of the day or, in some cases, at different rates throughout the day. Sometimes direct measurements are made of sources. More often, engineering estimates are used to calculate air pollutant emission rates. Many factors affect the amount of air pollutants released. These include fuel types and quantities, economic conditions, population growth, transportation patterns and auto use, and personal habits at home, work and play.

Using information from a variety of sources, the BAAQMD compiles inventories of emission sources. The inventories describe the types and numbers of sources, location and timing, and overall amounts and types of air pollutants emitted. These inventories differ on weekdays and weekends; they also differ by hour of the day, season of the year, and year-to-year. Effective air pollution control strategies take all of this information into account.

Figure 5 • 1987 Emissions of Carbon Monoxide



Carbon Monoxide
4154 Tons/Day

Source: BAAQMD (1991)

WHAT IF NOTHING IS DONE?

"Government regulations on business and industry are largely responsible for the air quality improvements over the past two decades."

For many years, air quality in the Bay Area has been improving and the emission of air pollutants has been decreasing. In the near-term this trend is likely to continue. However, in the longer term, it is more difficult to predict what will happen. Growth rates and technological advances are the most important factors in determining what air quality will be like five, ten and twenty years from now.

Improvements in Control Technology

Governmental regulations on business and industry are largely responsible for the air quality improvements experienced over the past two decades. Industry response to the regulations has resulted in less polluting processes being developed, improved control technologies being used, and more care in daily plant operations to reduce pollution. Large industries have had increasingly tighter controls imposed as new technologies emerged. Also, as large and medium sized businesses are tightly controlled, small businesses emerge as necessary targets for air pollution regulations. Individual contributions from small business operations appear insignificant. However, taken in total, the emissions from thousands of small sources become quite important. The '80s saw a plethora of rules affecting the operations of small businesses to reduce their contributions to the region's air pollution problems. Pollution from industrial and commercial activities is approximately constant, but will grow with the economy, absent further controls.

A major factor in reducing air contaminants in California and the nation has been cleaner cars, trucks, and buses. Beginning with the first catalytic converters in 1975, motor vehicle emissions have steadily decreased over the past fifteen years. This has occurred despite unprecedented growth in auto ownership and use, especially in states such as California. Because of California's unique air quality problems, cars sold in the State must meet even more stringent requirements than the rest of the nation. This has allowed California's cars to be even cleaner than other cars produced in the U.S. With these controls, today's cars are about 90% cleaner than their counterparts twenty years ago. But they are not clean enough.

Transportation sources are still a big part of the Bay Area air pollution problem. Even though cars and trucks are cleaner today, there are more of them on our roads. Because of our affluence and mobile lifestyles, we drive more than in the past. Historically, gas has been cheap and plentiful. Taking inflation into account, the real cost of driving is cheaper now than it has ever been in the past. Taking advantage of this and increased fuel efficiency, convenience and comfort of modern cars, Bay Area travel increased rapidly. Another reason for increased travel is greater suburban land development, often at low densities, resulting in more trips by car.

We have witnessed a simultaneous growth in population, cars and travel, while the technology of the cars continues to improve. The result has been less and less automotive pollution in an absolute sense, in spite of the region's growth. Technical improvements in the cars reduced the auto pollutants faster than the growth in the use of cars. These trends will continue in the Bay Area well into the twenty-first century.

Transportation Control Measures

Californians, including those in the Bay Area, epitomize the love

affair with the automobile. Even with much cleaner cars, the sheer number of vehicles makes them a significant source of air pollution. This is worse when there is traffic congestion. At slow speeds or in stop and go traffic, cars pollute much more than when driving along steadily on the roads. Increasingly, transportation planners realize there are limits to building more roads to deal with congestion. Instead, efforts are underway to use highways and roadways more efficiently. The focus is on moving the maximum number of people, rather than vehicles.

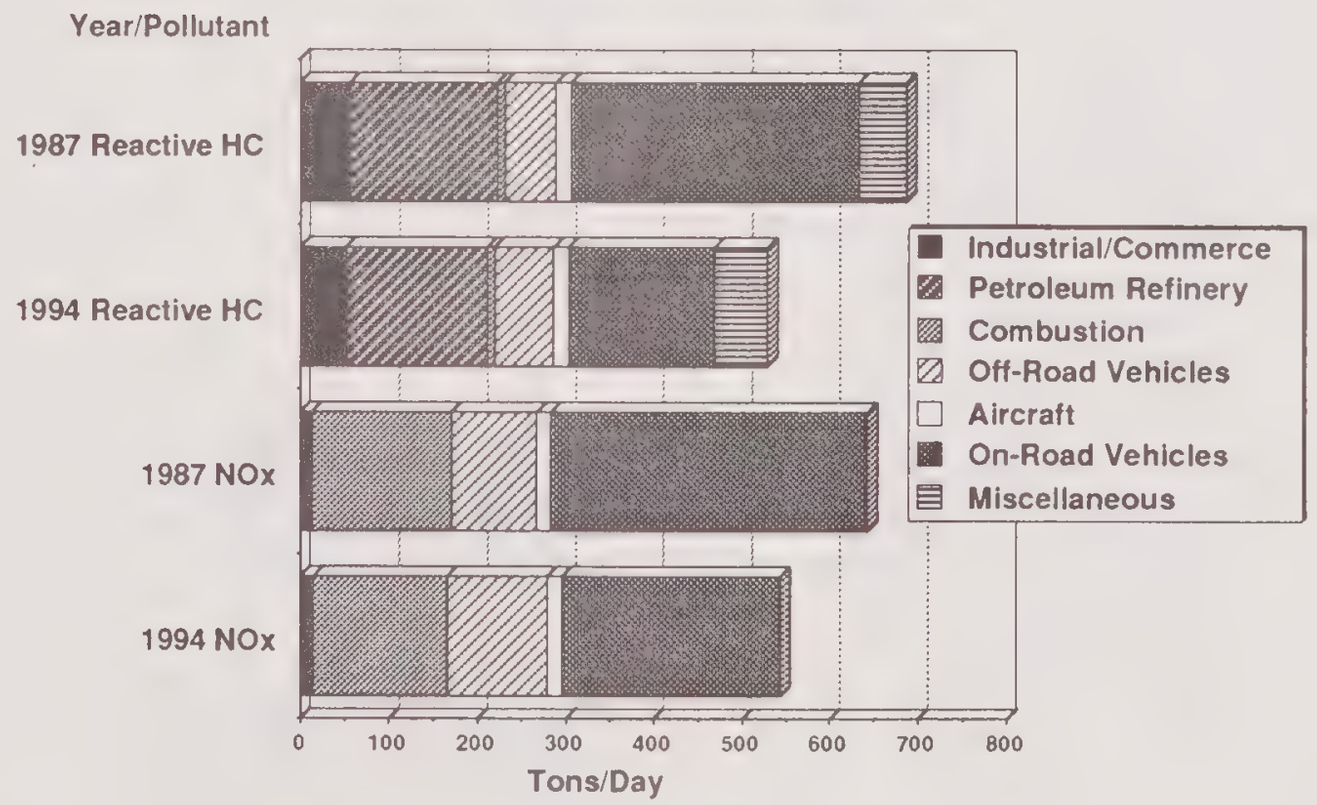
Reducing both the number of trips and distance traveled helps reduce air emissions. It also helps reduce traffic congestion and thereby improves mobility. Bay Area citizens are being asked to change their travel behavior. Compared to projected technological improvements, however, the gains are quite modest. Also, Bay Area lifestyles are deeply entrenched and difficult to change. For transportation controls to be more effective, other changes are necessary. More alternate modes of transportation need to be developed and funded. These modes need to be as economic, convenient and safe as driving alone. Land use patterns and new developments can be better planned to reduce auto dependency. Employers large and small can encourage their employees to find alternative ways of getting to the office.

Future Air Emissions

If the region continues to grow as forecast and all of the currently adopted control programs continue, future air emissions will decline as shown in Figures 6 and 7 and Table 2. The key assumptions in these emission trends are:

- Population, housing, employment, economic growth and land use will increase as regionally forecast;

Figure 6 • 1987 and 1994 Emission Inventory Trends: Reactive HC* and NOx



* Does not include about 300 tons/day RHC from natural sources

Source: BAAQMD (1991)

Table 2 • Bay Area Emission Inventory Trends: 1987-2000

Planning Inventory (Tons/Day)*

	1987			1994			1997			2000		
Base Year 1987	**RHC**	**NOx**	**CO**	**RHC**	**NOx**	**CO**	**RHC**	**NOx**	**CO**	**RHC**	**NOx**	**CO**
Industrial/Commercial Processes/Facilities												
Petroleum Refining Facilities	29	11	2	30	12	2	31	13	2	32	13	2
Chemical Manufacturing Facilities	5	2	28	5	2	31	6	2	33	6	3	34
Other Industrial Commercial/Processes/Facilities	22	0	0	16	1	0	17	1	0	18	1	0
Petroleum Product/Solvent Evaporation												
Fuels Refinery Evaporation	10	0	0	6	0	0	6	0	0	6	0	0
Fuels Distribution	24	0	0	24	0	0	25	0	0	25	0	0
Other Organic Compounds Evaporation	132	0	0	130	0	0	138	0	0	144	0	0
Combustion — Stationary Sources												
Fuels Combustion	8	157	356	8	150	388	9	156	401	9	164	414
Burning of Waste Material	1	1	2	1	1	2	1	7	8	1	7	8
Combustion — Mobile Sources												
Off-Highway Mobile Sources	57	96	269	65	112	310	63	119	328	63	124	342
Aircraft	17	16	59	18	18	68	19	18	72	19	19	74
On-Road Motor Vehicles	327	360	3438	166	248	2329	137	222	1923	110	202	1610
Miscellaneous — Other Sources	55	0	0	60	0	0	61	0	0	63	0	0
Grand Total	**687**	**644**	**4154**	**529**	**543**	**3130**	**512**	**538**	**2772**	**495**	**532**	**2485**

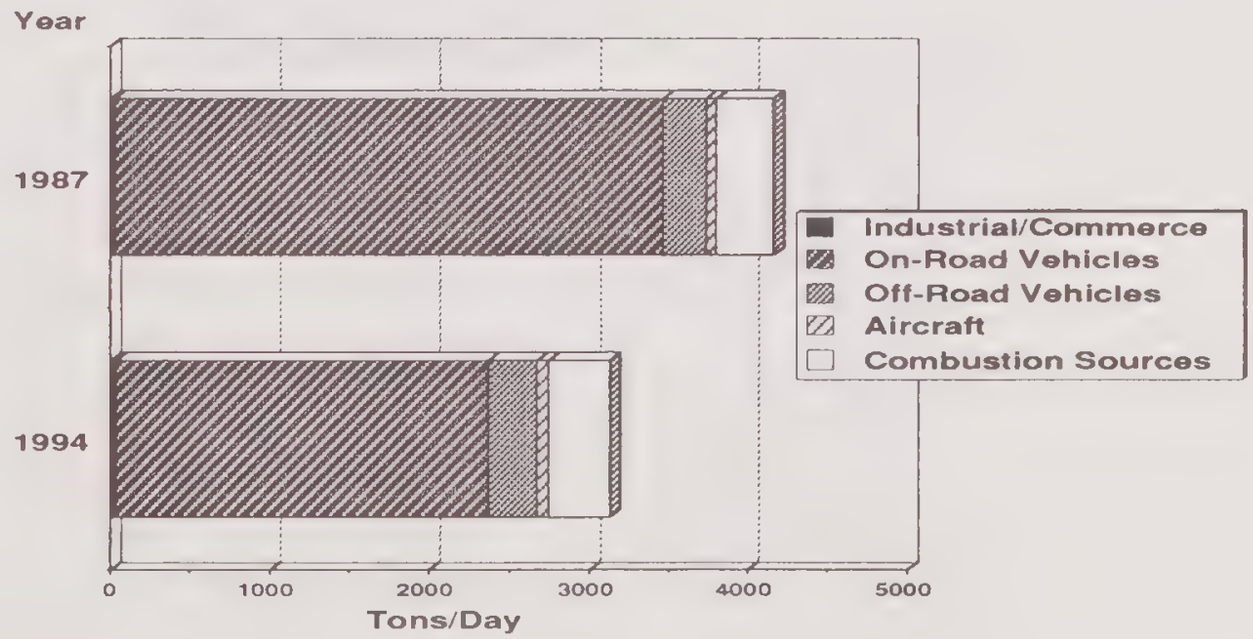
* Anthropogenic or man-made ozone precursors (RHC & NOx) for summer operating day (does not include about 300 tons/day RHC from natural sources); CO emissions for winter operating day

- Cars will become cleaner as required by California regulations;
- The recently improved "Smog Check" program will continue;
- Controls on industry and business will continue in force;
- Currently implemented transportation control programs will continue.

Air pollution control programs take many years to plan and implement. Once adopted, many of the controls require years to achieve maximum effectiveness. For example, tighter motor vehicle emission standards take ten years or more after a new standard goes into effect to achieve maximum reductions. This is the time necessary for turnover of most of the motor vehicle fleet. Other controls may require shorter implementation time schedules. Overall, however, programs planned and adopted during the '80s will in many cases be implemented and fully effective during the '90s. It is expected that air quality will improve for years even if no new additional programs are adopted.

"Motor vehicle emissions have steadily decreased over the past fifteen years despite unprecedented growth in auto ownership and use."

Figure 7 • 1987 and 1994 Emission Inventory Trends: Carbon Monoxide



Source: BAAQMD (1991)

FORECASTING FUTURE AIR QUALITY

It is always difficult to predict the future. Predicting air quality is no exception. Many factors affect it. Some are natural like temperature, geography, winds, cloud cover, and sunlight. More important, though are the people and their collective activities at home, work and play. The Bay Area represents a diverse set of urbanized activities occurring in a complicated natural setting of ocean, hills, bay, and flatlands. The **'91 CAP** calls for predicting future levels of ozone and CO.

"No practical strategy for meeting the State ozone standard was identified."

Some air pollutants such as CO are simply dispersed immediately after being emitted. For this pollutant, a sub-regional emission inventory is estimated. In the area where violations are anticipated, a linear "rollback" calculation is made. Ambient levels of CO are directly (and linearly) related to the localized emissions.

Predicting ozone air quality is much more complex. Reactive hydrocarbons combine with nitrogen oxides in sunlight to produce ozone, commonly called "smog." Ozone is thus the product of complex chemical and physical interactions. It is more readily produced in hot weather. Even though it is very reactive, it can also be carried many miles downwind. Ozone transport has been documented hundreds of miles across state lines and across national borders. Ozone created one day may persist for several days. Computer simulation of ozone formation and decay is complicated but possible; ozone prediction models have been in general use for almost twenty years. During this time, they have been continually improved and refined. These photochemical models are the best available tools for predicting the effect of control programs on air quality.

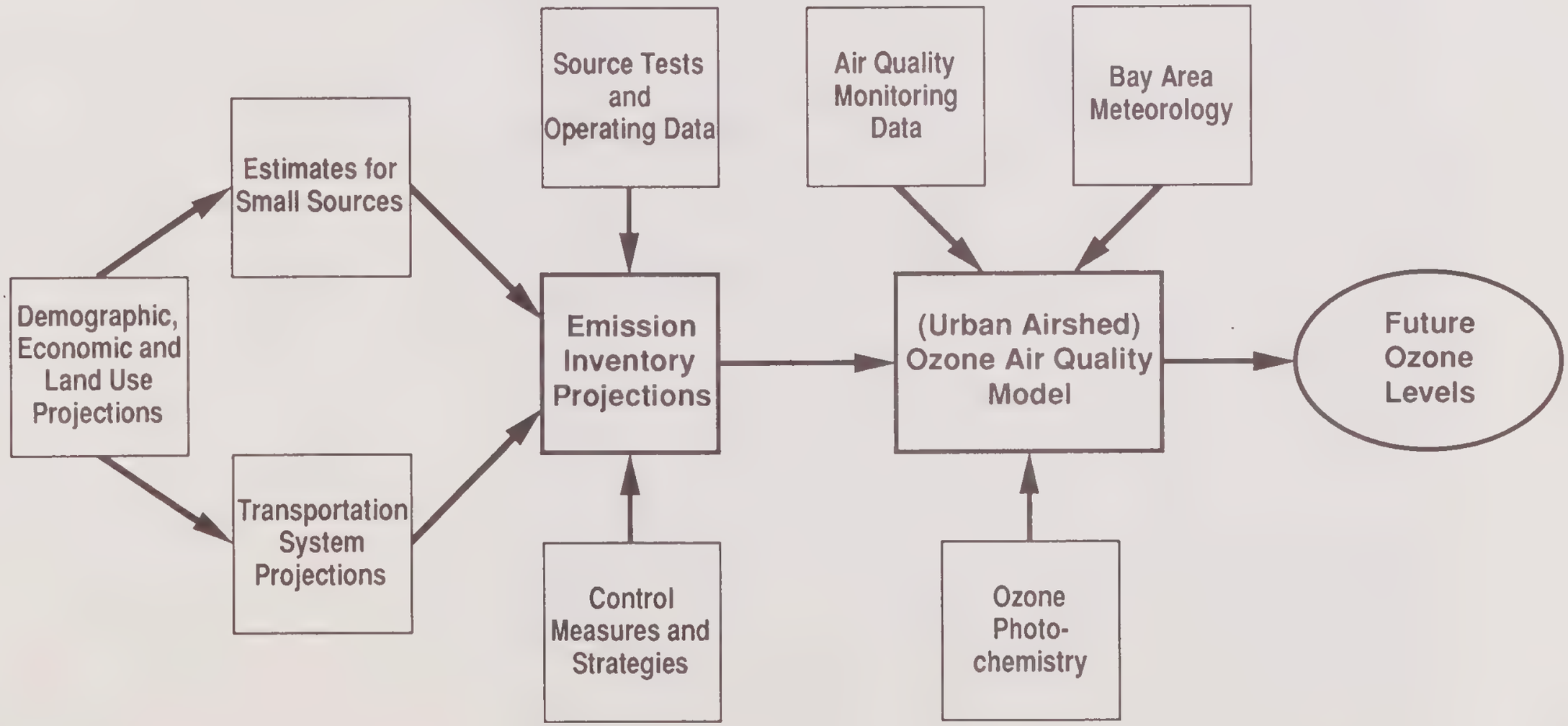
The Computer Modeling Process

Figure 8 presents a simple overview of the model used to project ozone air quality. The modeling begins with assumptions about future growth and development. ABAG projects population, employment, housing, and land use patterns in the region. MTC models transportation systems and travel behavior. Travel patterns are characterized by location, trip type, time, and mode of transportation. Using the most current emission factors, emissions for motor vehicles are calculated. Economic data are also used to project activity levels for industrial and commercial sources. Combined with engineering emission estimates for these sources, a comprehensive inventory for the region is developed.

The emissions data are combined with an extensive set of physical, chemical, and meteorological information about the Bay Area and atmosphere. The set of models is run extensively to replicate high air pollution events from the past. In this manner, the air quality models are tested to verify their accuracy. Using data from the BAAQMD's extensive monitoring network for a prototype day and estimating emissions for the region for a known set of conditions, air quality is modeled. Extra data were collected from a special summer field study in 1989. The model calibration phase ensures that the many engineering estimates made for emissions released combine realistically with the chemistry and meteorology of the air to give results close to actual measurements. A properly set up air quality model will reproduce reasonably accurately air quality conditions of the past. Such a tool allows forecasts of future air quality with different emission levels.

Once properly verified, air quality models are used to forecast future air quality. This is done by adjusting air emissions to reflect future conditions. Usually, the future is projected assuming only

Figure 8 • Overview of Ozone Air Quality Modeling



the currently adopted control programs. This future is often called the "baseline" condition.

"Future control programs will be less effective than those of the past for equivalent reductions of . . . hydrocarbons and nitrogen oxides."

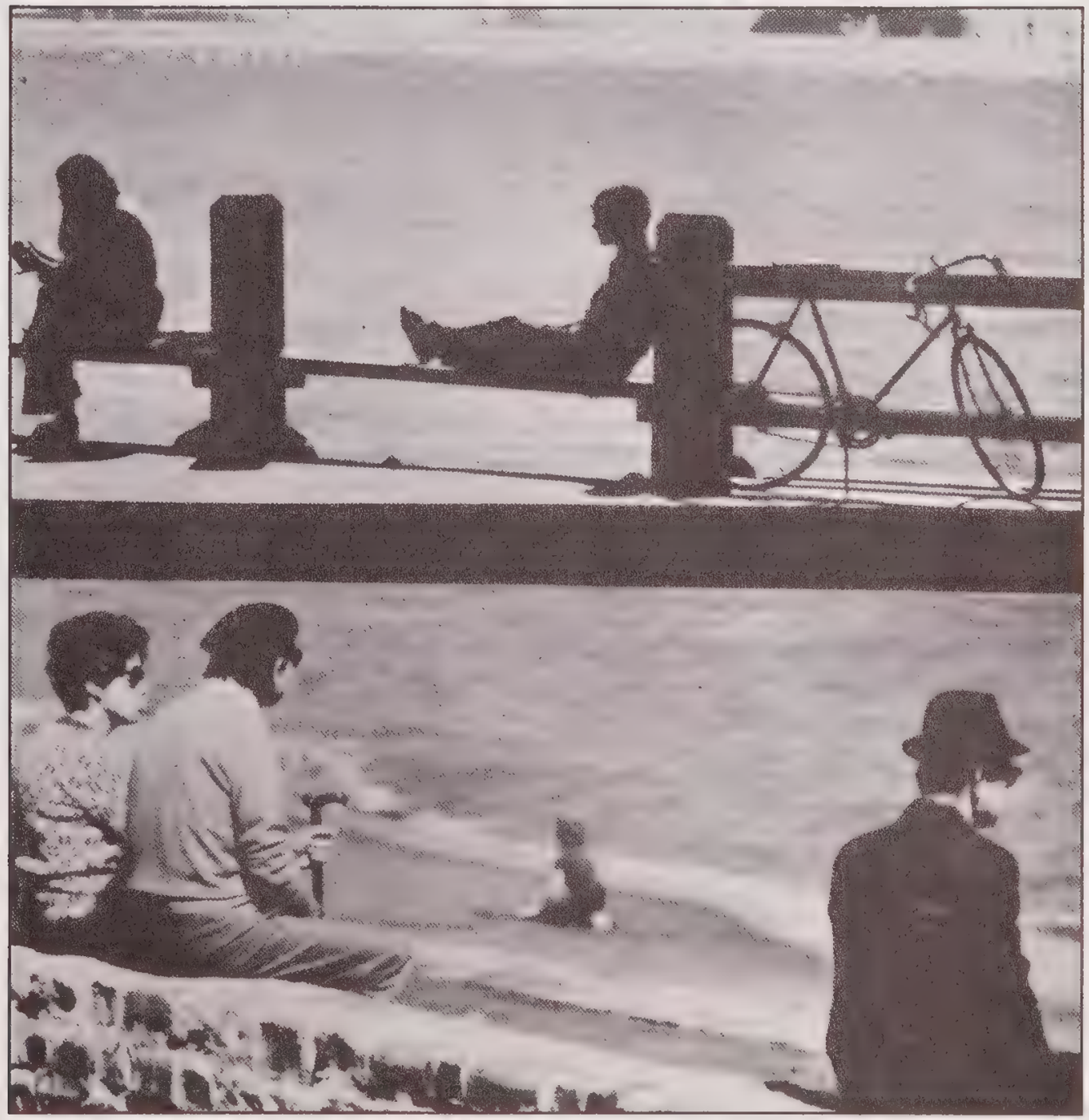
Air quality models are also used to test the impacts of new proposals for additional controls, e.g., air quality control strategies. Initial tests of future controls use overall emission reductions to identify the level of control needed to meet the standards. Later, specific measures or groups of measures can be tested for efficacy in reducing ozone. Such tests require the control strategy to be specified in terms of changes in the emission inventory. Interpreting the results of these different air quality simulations gives a technically based foundation for developing future control programs.

Typically, groups of individual measures are tested for their combined effects on the region's air environment. The changes expected from individual measures may not be large enough to show any significant air quality changes.

As of March, 1991 and after considerable air quality modeling, no practical strategy for meeting the State ozone standard was identified. The urban airshed modeling has been useful and provided much valuable information for the planning efforts. Among the findings thus far are:

- Hydrocarbon emission controls reduce ozone levels; however, improvements are increasingly non-linear and show diminishing returns; in other words, it gets increasingly difficult to achieve ozone improvements for each ton of HC removed.
- Controls of nitrogen oxides alone also reduce ozone levels; however, ozone hotspots are often produced;
- Combined hydrocarbon and nitrogen oxides controls also reduce ozone levels; again, percentage improvements are less than 1:1; and
- Very large emission reductions--up to 75%--of HC, NOx or HC/NOx combined might be required for attainment of the State ozone standard.

The complex photochemical nature of ozone production suggests that future control programs will be less effective than those of the past for equivalent reductions of precursor emissions--hydrocarbons and nitrogen oxides. Modeling and technical analysis will continue. Results will be used to evaluate the effectiveness of controls and to determine the most efficient program for implementation of new controls.



TOMORROW'S AIR QUALITY WITH TODAY'S CONTROLS

Previous sections have described the emissions trends likely under existing and adopted air programs. Also, computer models can be used to estimate what the resulting air quality will be with different emission levels. This section describes what the Bay Area can expect future air quality to be if nothing else is done. It assumes that new technologies will be introduced as the result of regulations already adopted. This is especially true for automobiles beginning in the mid '90s. Also, it assumes continued population and economic growth in the region. More people, jobs, cars, and travel will be evident.

"Between 1989 and 1997, projections show that HC and NOx emissions will decrease by about 20%. Ozone air quality will improve by less than 10%."

Using the air quality computer models, the first question addressed was what air quality will be with no additional controls beyond what is now being done. Thus, in 1997 if no additional programs are adopted, what will air quality levels be? The models predict air quality will continue to improve modestly, because of actions already taken. Between 1989 and 1997, projections show that hydrocarbon and nitrogen oxide emissions will decrease by about 20%. Ozone air quality will improve by less than 10%. The air quality models also project:

- Improvements in ozone with reductions in **either** hydrocarbon **or** nitrogen oxides emissions; in the latter case, some areas show **higher** ozone levels;
- Improvements in ozone with reductions in **both** hydrocarbons **and** nitrogen oxides emissions;
- Less than 1:1 ozone improvements with **any** emission reduction combinations;

The existing analyses suggest that the air quality levels will improve modestly from 1987 to 1997, but not enough to reach the State ozone air quality standard. For ozone, the highest level measured in the past three years was 0.15 ppm. This is the State "design value" or the official starting point for planning purposes. The goal is to reach the State standard of 0.09 ppm. Modeling shows the expected levels in 1997 will be between 0.13 and 0.14 ppm under current regulations. **State and federal ozone and CO design values are computed differently.**

Improvements in CO air quality are also expected from current trends. Again, this is primarily due to stricter inspection and maintenance programs and the continuing introduction of cleaner cars into the Bay Area's motor vehicle population. Increases in travel and congestion will continue to be more than offset by technological improvements and the "Smog Check" program. Regionwide Bay Area CO emissions in 1987 were about 4,150 tons per day. By 1994, the level of CO emissions will decrease by about one fourth to approximately 3,130 tons per day.

By 1994, CO standards in almost all Bay Area communities will be met. Occasional violations may occur in San Jose and Vallejo. San Francisco will probably attain the standard. The severity of these violations is projected to be less than the maximum levels of recent years. The 8-hour California standard is 9 parts per million (ppm). The State design value for CO is 12.0 ppm. By 1994, on a few occasions the maximum Bay Area levels in these communities are expected to be about 10 ppm, and the number of days over the 9 ppm standard will decline.

Tables 3-5 show the projected CO emissions inventories for the three sub-areas where CO violations are projected. As the tables demonstrate, the continued turnover of newer and cleaner cars will

Table 3 • Projected CO Planning Emissions Inventory: San Francisco County
*(Tons/Day)**

Source Category	1987	1994	1997	2000	2010
Mobile Sources					
On Road Vehicles					
Light Duty Passenger	206.49	139.51	115.33	96.35	62.60
Light and Medium Duty Trucks	49.41	40.69	35.49	31.04	23.50
Heavy Duty Gas Trucks	17.03	8.92	6.62	4.88	2.64
Heavy Duty Diesel Trucks	.95	1.03	1.05	1.07	1.19
Motorcycles	1.66	1.66	1.70	1.73	1.85
Heavy Duty Diesel Urban Buses	.87	.97	1.00	1.02	1.05
Total — On Road Vehicles	**276.41**	**192.80**	**161.19**	**136.10**	**92.83**
Other Mobile					
Off Road Vehicles	1.64	1.71	1.73	1.75	1.78
Trains	.19	.20	.21	.22	.23
Ships	.41	.44	.46	.47	.51
Mobile Equipment	7.46	8.23	8.32	7.94	8.17
Utility Equipment	3.67	4.41	4.78	4.87	5.19
Total — Other Mobile	**13.37**	**14.99**	**15.50**	**15.25**	**15.88**
Total — Mobile Sources	**289.79**	**207.79**	**176.69**	**151.34**	**108.71**
Total — All Sources	**327.00**	**246.54**	**215.98**	**191.03**	**149.21**

Source: CARB (1990)

* Totals may not add up due to independent rounding.

Table 4 • Projected CO Planning Emissions Inventory: Santa Clara County
*(Tons/Day)**

Source Category	1987	1994	1997	2000	2010
Mobile Sources					
On Road Vehicles					
Light Duty Passenger	580.85	433.15	376.02	330.01	343.60
Light and Medium Duty Trucks	138.94	109.52	94.12	81.44	61.70
Heavy Duty Gas Trucks	61.64	33.89	25.68	19.36	11.17
Heavy Duty Diesel Trucks	9.42	10.43	10.76	11.15	12.92
Motorcycles	3.96	4.38	4.66	4.95	5.90
Heavy Duty Diesel Urban Buses	1.08	1.25	1.29	1.33	1.39
Total — On Road Vehicles	**795.89**	**592.62**	**512.53**	**448.24**	**436.68**
Other Mobile					
Off Road Vehicles	11.44	12.30	12.53	12.74	13.26
Trains	.24	.26	.26	.27	.28
Aircraft - Government	1.19	1.19	1.19	1.19	1.19
Aircraft - Other	11.03	12.90	13.86	14.44	16.36
Mobile Equipment	20.03	23.24	23.87	23.32	25.09
Utility Equipment	11.06	14.49	16.15	16.75	18.78
Total — Other Mobile	**54.98**	**64.39**	**67.88**	**68.71**	**74.95**
Total — Mobile Sources	**850.87**	**657.01**	**580.40**	**516.95**	**421.63**
Total — All Sources	**934.85**	**748.30**	**674.12**	**612.46**	**521.99**

Source: CARB (1990)

* Totals may not add up due to independent rounding.

Table 5 • Projected CO Planning Emissions Inventory: Solano County
*(Tons/Day)**

Source Category	1987	1994	1997	2000	2010
Mobile Sources					
On Road Vehicles					
Light Duty Passenger	88.05	70.21	61.32	53.64	43.05
Light and Medium Duty Trucks	27.24	23.80	20.90	18.31	14.31
Heavy Duty Gas Trucks	8.82	5.25	4.12	3.21	2.06
Heavy Duty Diesel Trucks	2.12	2.50	2.66	2.84	3.59
Motorcycles	.61	.75	.83	.91	1.23
Heavy Duty Diesel Urban Buses	.05	.06	.07	.07	.08
Total — On Road Vehicles	**126.90**	**102.59**	**89.90**	**78.98**	**64.32**
Other Mobile					
Off Road Vehicles	2.25	2.72	2.88	3.02	3.40
Trains	.33	.40	.42	.44	.50
Ships	.01	.01	.01	.01	.01
Aircraft - Government	10.36	10.36	10.36	10.36	10.36
Aircraft - Other	.98	1.12	1.17	1.18	1.28
Mobile Equipment	1.62	1.90	1.97	2.03	2.26
Utility Equipment	1.81	2.28	2.46	2.51	2.74
Total — Other Mobile	**17.34**	**18.79**	**19.27**	**19.55**	**20.56**
Total — Mobile Sources	**144.24**	**121.37**	**109.17**	**98.53**	**84.88**
Total — All Sources	**162.67**	**143.26**	**132.22**	**122.59**	**111.71**

Source: CARB (1990)

* Totals may not add up due to independent rounding.

contribute most to improved CO levels well into the 21st century. San Francisco will improve the most. Solano County (where Vallejo is located) and San Jose in Santa Clara County will probably be the last areas in the region to meet the CO standard.

Air quality will improve throughout the region for quite a few years with no additional controls. However, air quality standards will still be violated. New and tighter controls are absolutely needed to reduce the number of violations, protect public health, and sustain steady progress toward the goal of meeting State standards. For ozone especially, each increment of progress is increasingly difficult. As ozone levels improve, the complex photochemistry of the atmosphere appears to become less and less responsive to emission reductions of hydrocarbons and nitrogen oxides. For example, reductions of precursor emissions that are needed to reduce ozone from 0.12 to 0.11 ppm will be **significantly greater** than those needed in the past to go from 0.18 to 0.17 ppm. This complicates the control planning efforts considerably.

"(Under current regulations . . .) air quality will improve modestly from 1987 to 1997, but not enough to reach the State ozone . . . standard."

CALIFORNIA'S "SEVERE AREA" DESIGNATION

"The region is unlikely to meet the State standards by 1997 with any practical strategy conceivable now . . . the area is . . . a severe area for planning purposes."

Under the California Clean Air Act, all regions of the State violating air quality standards are given one of three designations--moderate, serious, or severe. The designations describe the air quality problems of the area. They also prescribe the control programs needed to improve air quality. The basic difference in designations is **when** attainment of standards is projected:

- Moderate Areas - Project attainment **no later than 1994**;
- Serious Areas - Project attainment **no later than 1997**;
- Severe Areas - Project attainment **after 1997** (or do not project attainment or do not know when attainment is projected).

By law, a region's designation establishes the minimum requirements for control measures and programs to adopt. The intent of the law is to require those areas with the most severe problems to adopt the most stringent programs. Areas with less severe problems, in turn, may implement fewer and less demanding control plans, subject to meeting certain rates of progress.

Plans for **moderate areas** (i.e. meeting standards by 1994) must include the following:

- Reasonably available controls on all existing sources;
- No net increase in area's emissions from new or modified stationary sources larger than 25 tons/year;
- Reasonably available transportation control measures (TCMs);
- Indirect source and area source control programs;
- Emissions tracking system; and
- Regional public education program.

Areas which are categorized as **serious areas** (i.e. meeting standards by 1997) must satisfy all the requirements of moderate areas and additionally implement:

- No net increase in emissions from all new permitted stationary sources;
- TCMs to significantly reduce the rate of increase in vehicle travel; and
- "Best available retrofit" controls on existing stationary sources.

Lastly, areas that cannot meet the standards by 1997 are classified as **severe areas**. Plans for these areas must include all the requirements for serious areas, plus:

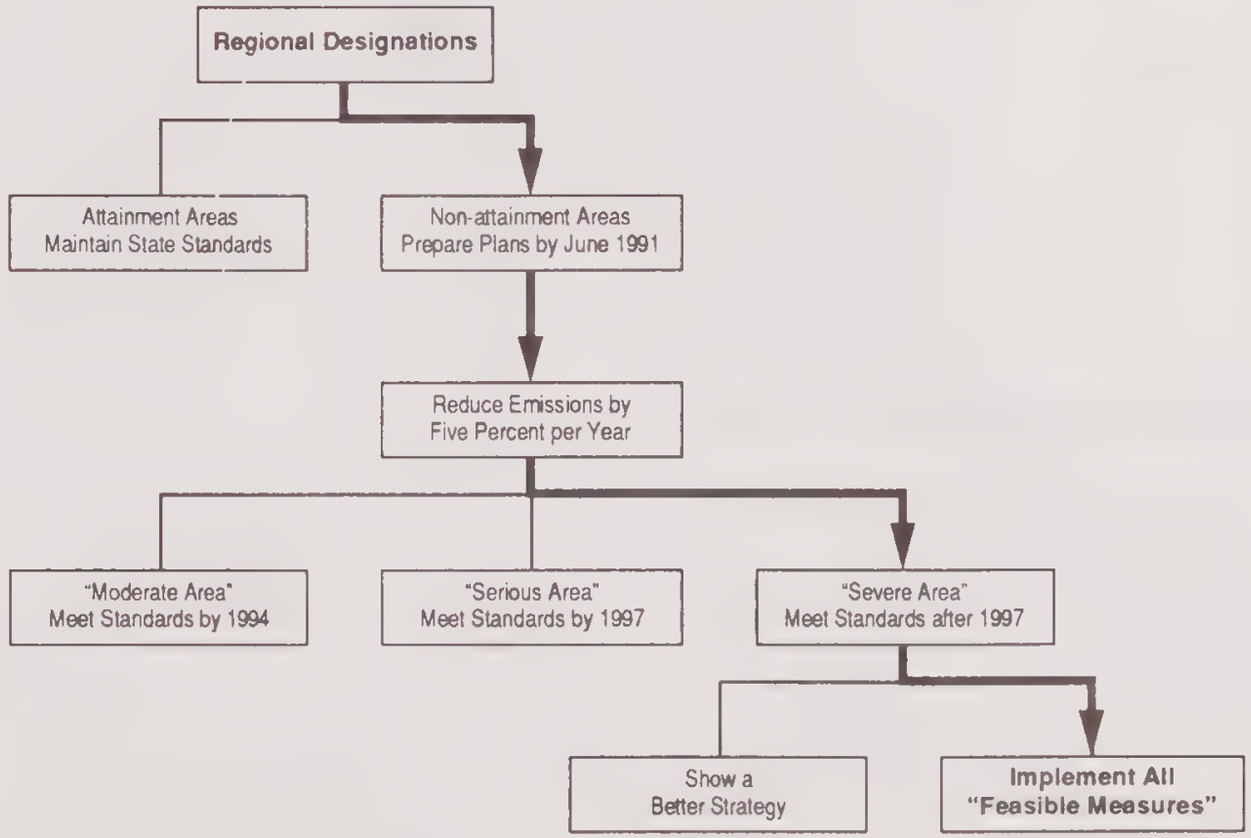
- TCMs to achieve a 1.5 average vehicle ridership from all travel during commute periods by 1999;
- Measures resulting in no net increase in vehicle emissions after 1997;
- Significant number of low-emission vehicles in fleets; and

- Programs reducing population exposure to ozone levels above the State standard by 25% by 1994 (from a 1986-88 baseline).

The previous section described the region's air quality with no additional control programs. It also summarized projected ozone improvements modeled with emission reductions of hydrocarbons, nitrogen oxides and combinations of these pollutants. The region is unable to meet the State standards by 1997 with any practical strategy conceivable now. Recognizing this, the area is classified a severe area for planning purposes. Most urban areas of the State will be classified severe.

Figure 9 shows an overview of the CCAA designation and planning requirements. Each area is to assess its problems and determine (with State concurrence) what minimum planning programs to include in the region's plan. All areas are to reduce pollutant emissions by five percent per year. If this is not possible, they are to implement all "feasible" measures. The requirements for severe areas such as the Bay Area are explained more fully in the following section.

Figure 9 • Overview of CCAA Planning Requirements



CONTROLS NEEDED TO SATISFY "SEVERE AREA" REQUIREMENTS

Areas unable to meet the standards by 1997 must prepare plans to satisfy "severe area" requirements. These have been briefly noted before. In addition, an emission inventory accounting must take place. Using 1987 as the baseyear for measuring progress, emissions must be reduced by five percent per year.

In the Bay Area, this means three pollutants--carbon monoxide, reactive hydrocarbons and nitrogen oxides. For the plan due in 1991, emission reductions must be shown from 1987 to 1994. Five percent emission reductions for these seven years requires showing a 35 percent decline in emissions by 1994. If an area is **unable** to show this level of emission reductions, it must demonstrate that all "feasible" measures have been proposed for implementation.

"Emissions must be reduced by five percent per year . . . If an area is unable to show this . . . it must demonstrate that all 'feasible' measures have been proposed."

The **'91 CAP** contains many programs to be carried out by different levels of government. It requires participation by both the public and private sectors. The controls represent doing everything feasible between now and 1994. Inventory projections for the future show that the Bay Area falls short of reducing emissions of reactive hydrocarbons and nitrogen oxides by five percent annually. The shortfall is more pronounced for NOx emissions. Table 6 shows the projected emission reduction rates from 1994-2000. The 1994 emissions included all currently adopted and proposed programs in the **'91 CAP**.

CO emissions in localized areas violating the 8-hour standard can be reduced by five percent per year through 1994 if certain controls are put into place. Specifically, the introduction of oxygenated fuels in winter months is needed, as required by the recently enacted federal Clean Air Act of 1990. Combined with tighter exhaust emission standards and a more effective "Smog Check" program, CO emission reductions will decrease by at least five percent annually.

Carrying out all "feasible" measures will continue the comprehensive control strategies that have typified the Bay Area programs for several decades. This approach has relied on stringent controls for stationary sources, both new and existing. Also, it requires controls on smaller and smaller business operations. Many of these had never been controlled before, such as printing and painting shops, dry cleaning establishments, various electronic manufacturing operations, and bakery ovens. During the '90s these control efforts will continue and others will be proposed.

A comprehensive approach also means cleaner motor vehicles. New automotive technologies are being mandated by federal and California motor vehicle emission standards. These tighter standards cover vehicles of all types--autos, motorcycles, trucks, and buses. By the end of this century, much lower emitting vehicles will be available for purchase. Some will continue to be gasoline powered. It will also be increasingly common to see cars powered by alternative fuels--natural gas, electricity, propane, or oxygenated fuels. Future cars will have more stringent warranties--up to 100,000 miles, and most probably a more stringent and annual "Smog Check" requirement before registration renewal.

In addition to cars and other motor vehicles, small engines of all types will also be controlled. Emissions from lawn mowers, leaf blowers, chain saws, and a host of other gasoline powered utility appliances will be reduced. Individually the emissions from these tools are small. In total, however, because thousands are used daily, these emissions become significant. New technologies will

Table 6 • CCAA Rate of Emission Reductions

	Baseline Inventory Projections * Tons/Day			# Years From Baseyear	Target 5% Annual Reduction	Target Inventory Tons/Day			Additional Reductions to get 5%/Year Tons/Day			Maximum Reductions Possible with '91 CAP Tons/Day		
	RHC	NOx	CO			RHC	NOx	CO**	RHC	NOx	CO	RHC	NOx	CO
1987 Baseyear	687	644	4154	0	0	687	644	4154	—	—	—	—	—	—
↑														
'91 CAP														
↓														
1994	529	543	3130	7	35	447	419	2700	82	124	**	38	19	**
1997	512	538	2772	10	50	344	322	2077	168	216	**	69	70	**
2000	495	532	2485	13	65	240	225	1454	255	307	**	110	120	**

* From Table 2

** Regional CO inventory targets for 5% per year reduction are shown, but actual targets and rates depend on nonattainment sub-area analyses for San Francisco, San Jose, and Vallejo. See Table 11 for additional details.

be needed and modest additional costs will be inevitable. It is clear these measures are feasible and will be introduced before the decade is out. The only question remaining is how soon and to what extent these different engines can be controlled. The California Air Resources Board (CARB) has responsibility for these programs in order to maintain statewide uniformity. This is necessary to provide a known and predictable market for the manufacturers. CARB regulations adopted to control these engines in December, 1990 will be carried out over the next few years.

There are limits to technological improvements, whether for stationary or mobile sources. Technical, engineering and developmental constraints limit how effective new technological controls are in reducing emissions. Economic considerations often need to be factored into control technology approaches. Lastly, legal and institutional factors must be weighed in designing a new control measure. Nevertheless, most emission reductions over the past twenty years have come from technological improvements.

"The Bay Area will fall short of reducing reactive HC and NOx emissions by five percent annually."

Growth tends to offset the gains achieved from better technological controls. Population and economic growth are responsible for more pollution generating activities of all kinds. The Bay Area has grown in 1990 to slightly more than six million residents, an increase of more than 840,000 (i.e., 16% increase) from the 1980 census. The numerical increase alone does not give an accurate picture. Significantly greater economic growth has given the region's residents substantial affluence. Results of this relative prosperity are seen in many more cars being driven more frequently, bigger homes located typically in suburban locations, and energy-intensive and consumptive lifestyles that exacerbate air pollution.

The transportation system and development patterns of the region during the past twenty years have contributed to somewhat slower air quality improvements than otherwise might have been achieved. Transportation systems are planned by a myriad of agencies, most focused on one mode of travel. Land use decisions affecting the region's housing and jobs are made by a hundred local governments. Coordination is largely voluntary with fiscal considerations pre-eminent in most cases.

Measures to improve land use and transportation planning for air quality benefits are feasible. The major constraints are and will continue to be economic and institutional. These limitations are significant and not easily overcome.

A real change in lifestyles is necessary to further reduce air emissions and improve air quality. A partnership of federal and State agencies working with local public and private institutions is needed to bring about such changes. Federal and State agencies will need to provide technical guidance, oversight and financial assistance to the region. Local governments working closely with the private sector need to agree on the costs, time schedules, and control programs to be carried out. Measures requiring changes in behavior and lifestyle must be effectively communicated through a comprehensive regionwide public education program. Such a program must be clear, targeted widely to different audiences, and sustainable for many years.

WHAT CAN BE DONE TO CLEAN UP THE AIR?

The Bay Area has a long time commitment to carrying out programs and plans to improve air quality. This commitment has led to marked improvement regionwide. Cleaning the air is an ongoing and dynamic process, however. As an area with a "severe" problem and ongoing violations of air standards, much more needs to be done.

Over the years many proposals have been presented for reducing air pollution. Many of these suggestions are now being carried out. Pollution control has become a standard element of industrial design, product formulation, and land-use considerations.

Previous plans lay the foundation for developing the current plan. With input from industry, environmental groups, and the public, a broad array of ideas for further action is gathered. Both old and new concepts are reviewed again. Notions which may have been far fetched a decade ago may be very feasible now.

Table 7 presents a list of measures considered in developing the **'91 CAP.**

Those familiar with air quality planning recognize Table 7 as a survey of possible control alternatives. The alternatives are categorized by control sector--e.g. industrial, motor vehicle, TCMs. Both new measures and more stringent revisions to existing controls are included.

Air quality plans throughout California and across the country have followed this basic approach for many years. Strategies have always relied on **continuous and permanent** control programs. The foundation of the Bay Area's success has indeed been built upon continuous, permanent controls. Future plans must again rely on this approach.

The severe nature of the region's problem calls for new and innovative methods too. For the first time, the Bay Area is proposing a series of **intermittent controls** as an integral part of the control strategy. These measures affect the industrial community and transportation sources. They rely on the improved ability of professional meteorologists to forecast days of potentially high pollutant levels. When such days are predicted, people will be asked to voluntarily re-schedule certain activities. For example, bulk fuel transfers or unloading operations, commercial painting, asphalt roofing and road repair operations could be affected. Workers would be encouraged to make special efforts to carpool, use transit or telecommute. Bay Area residents would be asked to defer painting their house, having outdoor barbecues, or cutting their grass with gas powered lawn mowers. On certain winter nights with high pollution potential for carbon monoxide and particulate matter, people would be asked not to use fireplaces or wood stoves.

Air pollution from one individual action is negligible. Multiplied thousands of times, during periods of high ozone and CO forming potential, the actions are significant. In many cases, the actions could potentially avert violations of air quality standards.

Intermittent controls are not a substitute for permanent controls. They are complementary. Properly implemented, they can be a very cost-effective adjunct to the core planning proposals. In this plan, intermittent controls are presented as a package of voluntary controls; it is clearly possible to develop such controls as regulations which must be adhered to. The voluntary approach will allow the region to gain experience with intermittent strategies, assess their strengths and weaknesses, and evaluate their potential.

Table 7 • Options Considered in Developing the '91 CAP

Stationary Sources

Surface Coating and Solvent Use

- Improved architectural coatings rule
- Emissions charges on architectural coatings
- Improved aerospace coatings rule
- Improved industrial maintenance coatings rule
- Improved wood furniture and cabinet coatings rule
- Improved surface coating of miscellaneous metal parts and products rule
- Improved surface coating of plastic parts and products rule
- Improved can and coil coating rule
- Improved paper, fabric, and film coating rule
- Improved magnet wire coating operations rule
- Improved automobile assembly coating operations rule
- Improved automobile refinishing rule
- Improved general solvent and surface coating rule
- Improved surface coating of large appliances and metal furniture rule
- Improved coating of flat wood paneling and wood flat stock rule
- Further control of emissions from polyester resin use in manufacturing
- Ban on non-architectural outdoor spray painting
- Further control of emissions from adhesives use
- Improved graphic arts printing operations rule
- Improved semiconductor manufacturing operations rule
- Improved solvent cleaning operations rule
- Substitute solvents used for clean-up of surface coatings
- Control of emissions from solvent waste
- Improved petroleum dry cleaning rule
- Improved/expanded perchloroethylene dry cleaning rule
- Control of emissions from pesticide application
- Improved coatings and ink manufacturing rule
- Improved resin manufacturing rule
- Control of emissions from cleaning up organic liquid spills
- Elimination of coatings rules alternative emission control plans
- Control of emissions from household solvent disposal
- Ultra-low VOC coatings

Fuels/Organic Liquids Storage and Distribution

- Requirement for P/V valves at gasoline dispensing facilities
- Control of emissions from gasoline transfer: fail-safe Phase I vapor recovery systems
- Control of emissions from gasoline transfer: improved installation and repair of Phase II vapor recovery systems
- Requirement for vapor recovery at aviation refueling facilities
- Requirement for Phase II vapor recovery at pleasure boat refueling facilities
- Improved gasoline terminal and bulk plant rules
- Submerged fill crude oil loading racks
- Control of emissions from railcar loading
- Improved storage of organic liquids rule
- Control of emissions from propane handling
- Improved organic chemical terminals and bulk plants rule
- Limitations on marine vessel tank purging
- Further emission reductions from gasoline delivery vehicles

Table 7 • Options Considered in Developing the '91 CAP

Stationary Sources

Refinery and Chemical Plant Processes

- Improved pressure relief valves at refineries and chemicals plants rule
- Improved pump and compressor seals at refineries and chemical plants rule
- Improved valves and flanges at refineries and chemical plants rules
- Further control of emissions from wastewater treatment at refineries
- Improved vacuum producing systems and process vessel depressurization rules
- Improved wastewater (oil-water) separators rule
- Control of emissions from flares

Combustion of Fuels (NOx Sources)

- Control of emissions from non-utility internal combustion engines
- Control of emissions from stationary gas turbines
- Control of emissions from electric power generating boilers
- Control of emissions from boilers, steam generators and process heaters
- Limitation on the operation of sources of standby power
- Control of emissions from oil field steam generators
- Control of emissions from crude oil pipeline heaters
- Control of emissions from oil well drilling rigs
- Limitation on the use of fuels at stationary sources
- Control of emissions from residential water heating
- Further emission reductions from residential furnaces
- Control of emissions from swimming pool water heating
- Control of emissions from afterburners
- Control of emissions from glass melting furnaces
- Control of emissions from cement plant kilns

Other Industrial/Commercial Processes

- Improved natural gas and crude oil production facilities rule
- Control of emissions from commercial charbroiling
- Control of emissions from rubber products manufacturing
- Improved solid waste disposal sites rule
- Improved aeration of contaminated soil rule
- Control of emissions from asphalt concrete plants
- Control of emissions from wineries
- Control of emissions from OCS exploration, development and production
- Control of emissions from fumigation booths
- Control of emissions from expanding plastics and blowing foam manufacturing operations
- Control of emissions from servicing of motor vehicle air conditioners
- Control of emissions from livestock waste
- Control of ozone from irradiation beams
- Incinerator efficiency requirements

Table 7 • Options Considered in Developing the '91 CAP

Stationary Sources

Residential and Public Sectors

- Control of emissions from starter fluid use
- Control of emissions from consumer products
- Control of emissions from fireplaces and woodstoves
- Control of emissions from publicly owned treatment works
- Out-of-basin transport of biodegradable solid waste
- Control of emissions from tree replacement

Other Stationary Source Control Measures

- Citizen postponement of discretionary activities
- Industrial postponement of discretionary activities
- Improved new source review rule
- Installation of best available retrofit control technology
- Improved refinery bubble requirements
- Low emission methods and materials for building construction
- Emission minimization management plan
- Promotion of energy efficiency
- Enhanced enforcement of existing district regulations

Table 7 • Options Considered in Developing the '91 CAP

Mobile Sources

Motor Vehicles

- Smoking vehicle program
- Requirement for clean fuel vehicle fleets
- Urban bus system electrification
- Clean fuel retrofit of transit busses
- High polluting vehicle retirement program
- Remote sensing vehicle monitoring program
- Mandatory 'cleaner' reformulated gasolines

Transportation System and Land-use

- Ozone excess 'no drive days' (voluntary)
- Ozone excess 'no drive days' (mandatory)
- Indirect source review public transportation offsets
- Banning of new drive-through facilities

Off-road Mobile Sources

- Marine vessel cold iron requirements
- Control of emissions from jet aircraft
- Control of emissions from marine diesel operations
- Control of emissions from switching locomotives
- Control of emissions from utility equipment
- Control of emissions from gasoline farm tractors
- Control of emissions from diesel construction equipment
- Control of emissions from pleasure boats
- Control of emissions from off-road motorcycles

Table 7 • Options Considered in Developing the '91 CAP

Transportation Control Measures

Marketplace Strategies

Economic Measures Which Affect How Autos are Used and How Often

- Gas tax increase
- Bridge toll increase
- Toll roads
- Automated "high tech" roadway user fee
- Smog fees based on auto emission levels
- Parking: costing strategies
  - lot fees (sliding scale, long-term versus short-term differentials)
  - levies on employer/commercial lots based on parking spaced used
- Auto free/no parking zones (restrict market supply)
- Taxation policies
  - tax credits for transit users, no-car households, those living close to jobs
  - increased taxes on autos: sales taxes, property taxes, health taxes
- Employer travel allowances
- Auto insurance strategies
  - rate decreases for alternative mode users
  - rate decreases for short commutes
  - rate increases on sliding scale for multi-vehicle owners
- Increased subsidies for transit; decreased fares
- Increased subsidies for carpool/vanpool

Table 7 • Options Considered in Developing the '91 CAP

Transportation Control Measures

Enriching Commuter Options

Expand Regional Transit and Ridesharing System to Serve More Travelers

1. TRANSIT

- Extend regional rail systems; provide more passenger parking and feeder service
- Establish inter-regional rail service
- Increase service effectiveness of transit
  - increase reliability and frequency
  - increase convenience (reduce transfers, single pass instrument among systems)
  - increase amenities (e.g. "first-class" service: price upwards accordingly)
- Consolidate transit services
- Increase cost-effectiveness through competitive bidding
- Expand and restructure local/off-peak transit services

2. RIDESHARING and TRIP PLANNING COORDINATION

- Increase carpool/vanpool provider options
  - vendor support
  - trial/demonstration vehicles available to new poolers
  - vanpool insurance pool
- Guaranteed ride home for pool participants
- Expand RIDES' matching capabilities and services to employers
- Centralize ridematching services at employer sites
- Expand park and ride lots; place services closer to lots
- Aggressive marketing of all alternative modes (including public media advertising)
- In-home ridematching (computer access); more retail outlets
- Personalized ridematching and trip making services (by carpool or alternative mode)
- Employer in-house trip coordination (errands, meetings)
- Public meetings at transit accessible locations

3. BICYCLES

- Provide city bicycle paths and bicycle streets; regional bike route system
- Increase bicycle parking, storage and security facilities
- Bikes on buses/rail transit
- Assign bicycle days

4. OTHER OPTIONS

- Increased water transit options
- Pedestrian priorities policies-urban design (e.g. no limits like pedestrian control signals)
- Taxi reforms: increase service availability

Table 7 • Options Considered in Developing the '91 CAP

Transportation Control Measures

Manage Congestion

Manage freeways and local streets to reduce congestion

- Implement Traffic Operations System (TOS) for highways
  - incident management
  - ramp metering
  - message signs/traffic advisories
- Improve alternative routes for short trips
- Coordinate signal timing on local street systems
- Improve freeways ramps and merges
- Eliminate bottlenecks on existing freeway system
- Visual barriers on freeways to eliminate "driver gawking"
- HOVs on local streets and arterials
- Increased crackdown on double parking
- "Don't block the intersection" rules
- Change trucking delivery schedules
- Separate HOV lanes for buses versus carpools
- "Smart roads"
- More public information regarding timed signals (directional signs)
- Regulate timing of major event trip attractors (i.e. sporting events) to avoid peak hour rush
- Bus/transit signal preemption
- Transportation Management Program (TMP) during road construction
- Permanent TMP programs (don't just implement during construction as mitigation measures)
- Staggered school versus commute start times
- CHP pace cars
- Restrict weaving
- Better driver education: harder tests; more frequent driving tests

Table 7 • Options Considered in Developing the '91 CAP

Transportation Control Measures

Regulate Driving

1. LIMIT AUTOMOBILE USAGE

- Control gasoline supply
- Limit car registration in the region
- Assign driving days
- Force phase out of older cars
- Require stringent employer commute alternative programs
- Control truck traffic
  - off-peak delivery and pick-up
  - voluntary versus mandatory programs
- Restrict older (more polluting) car usage
  - Buy-back of older cars
  - Annual I & M program
  - Flat registration fees on cars or increased registration fee on older models
  - Citations for "smoking" vehicles
- Reduce ownership of vehicles (e.g. prohibit extra cars)

2. LIMIT DRIVERS

- Restrict DMV licensing: deny license after certain number of accidents/restrict driving to off-peak hours
- Smart drivers: improve driver education
- Limit parking availability

Auto Facilities Restrictions

- Limit further highway expansion
- Limit parking space in the region
  - Limited parking balanced with alternative option/access
  - Revisions in parking codes
  - Developer parking caps
  - "Buy back" parking space/convert to other uses
  - Municipally controlled parking (objective: easier control and regulation of lots)

Table 7 • Options Considered in Developing the '91 CAP

Transportation Control Measures

Technological Fixes

1. CAR TECHNOLOGY

- Weight and engine redesigns (including electric vehicles)
- Mitigate "cold start" effects

2. FUEL TECHNOLOGY

- Use oxygenated fuels
- Use alternative fuels
- Reduce toxicity of diesel fuel

3. TELECOMMUNICATIONS

- Work at home
- Integration of "techno alternatives" into organizational philosophy (i.e. telecommuting programs and training)

Voluntary Programs

Education and Information

- Education regarding auto use, health, and the environment
- Education on economics of long commute, "budgeting" travel, the advantages of trip linking
- City sponsored transit fairs
- School curriculum tc include alternative modes; classes and field trips by public transit
- Regional transit information centers
- Computerized trip making information, air quality information

Growth Management and Land Use

- Enact "Balance Growth" ordinances— provide local housing before adding new jobs
- Jobs/housing balance (balanced by income "affordability," as well as geographically)
- Building permits conditioned on alternative mode programs
- Improved transit access between jobs and housing
- "Acceptable" transit infrastructure in neighborhoods
- Improved pedestrian access/improved site design
- Electric vehicle zones in commercial developments
- Mixed use development supporting transit use
- Increased densities; in-fill development
- Tax revenue sharing to balance residential/ commercial development
- Regional approval of development
- Plan location/schedule construction of transit access prior to completing new development
- Developer bids: meet conditions for accessibility to alternative modes

SORTING THROUGH THE CLEAN AIR OPTIONS

"Will the public accept the measure?"

An integral part of developing the **'91 CAP** is screening the possible measures. Evaluation criteria are used to review alternatives and professional staff judgments are used to refine the options. Factors used to assess the various control measures include:

- Effectiveness - how effective will the proposal be in reducing emissions?
- Technical feasibility - is the technology available and proven?
- Costs - what are the direct and indirect costs of the alternatives?
- Cost-effectiveness - relative to other measures, how cost-effective is the control alternative?
- Schedule - how quickly can the measure be implemented and reductions achieved?
- Legal issues - is new legislation needed to carry out the proposal?
- Institutional - does authority exist to adopt, carry out, monitor and enforce the control measure?
- Financial - are financial resources available to implement the proposal?
- Enforceability - can implementation be monitored and enforced?
- Public acceptance - will the public accept the measure?
- Other impacts - does the proposal have other positive or negative impacts--e.g., energy, travel time and convenience, equity?

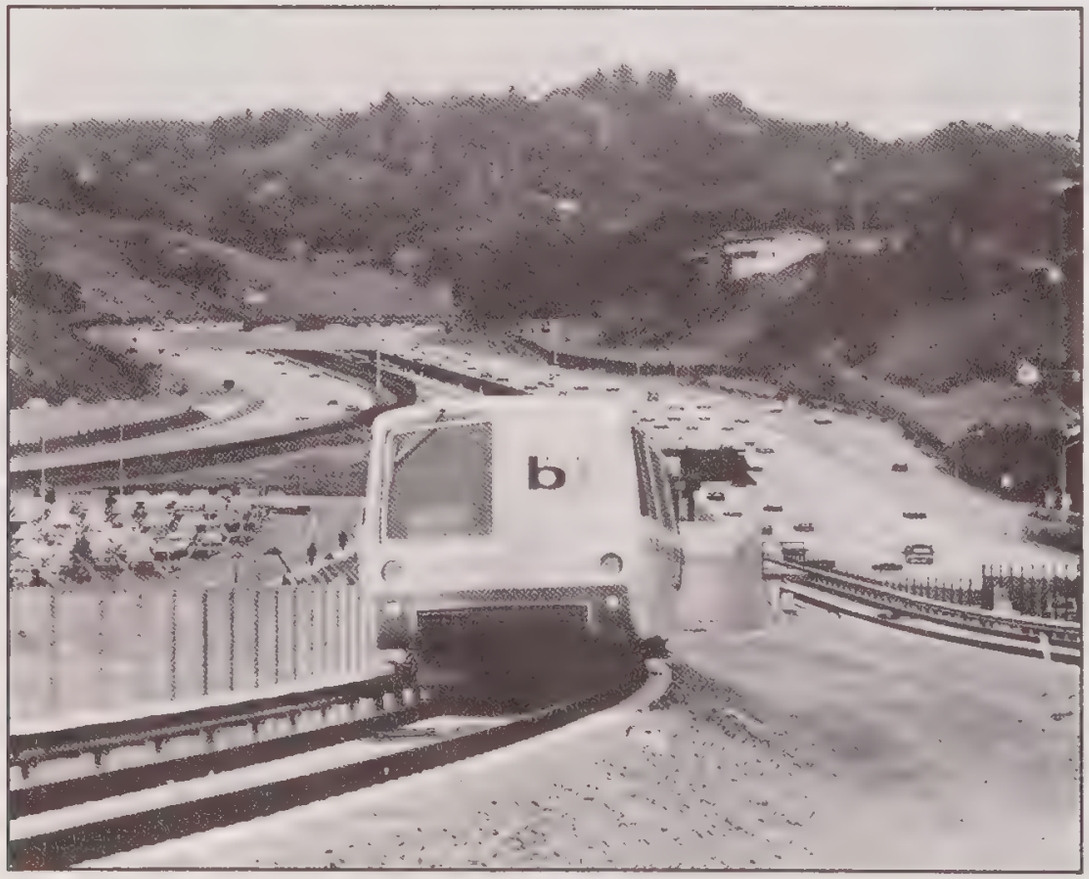
The above factors are analyzed both quantitatively and qualitatively. Input from those potentially impacted is important. The comments received help to refine and adjust the proposals. In some cases, unexpected impacts or costs are brought to light and better alternatives are identified. This section summarizes the assessment process used to identify those measures which appear to be most feasible for the **'91 CAP**.

Technical effectiveness of proposed measures is of paramount importance. The goal of the plan is improving air quality and meeting the standards as quickly as possible. Ideally, other beneficial objectives could and would be met. However, the '91 CAP is not **primarily** designed, to manage growth, reduce congestion, save energy, reverse global warming, or encourage transit usage. It is designed to protect respiratory health. Controls which achieve emission reductions **and** simultaneously result in improving other public policy objectives are favored. Many measures result in tradeoffs of public policy goals, making their evaluation more difficult.

Screening the many air quality proposals is challenging because it is difficult to agree on the most important evaluation criteria. Businesses often cite jobs, economic competitiveness and viability as the most important considerations. Environmentalists respond with concerns of growth management, maintenance of open space, improved jobs and housing balance, and the need for far less auto dependency. Public interest groups cite equity concerns and the

ability of poor or disadvantaged groups to pay for air pollution controls. All these considerations are important. Tradeoffs must be made and balanced. The '91 CAP strives for maximum reduction in air pollution emissions while considering all of the factors described above.

"Technical effectiveness . . . is of paramount importance . . . many measures result in tradeoffs of public policy goals, making their evaluation more difficult."



A BAY AREA PROPOSAL

This **'91 CAP** is intended to meet all applicable requirements of the CCAA. The Bay Area strategy presented will improve air quality throughout the '90s. In doing so, it will reduce the health risk to the public. But the **'91 CAP** is unlikely to result in meeting the ozone standard by 1997. If carried out as presented, it should meet the CO standard (and the federal ozone standard) sometime during the mid-90s. Uncertainty always exists in these projections because of the significant year to year variations in weather conditions. Some years have more days with conditions favoring pollutant buildup; other years have fewer such days. On the average, air quality trends show definite improvements which should continue through the '90s.

This proposal reduces reactive hydrocarbons, nitrogen oxides, and carbon monoxide emissions substantially. The ozone precursors--HC and NOx--are reduced at a rate less than five percent per year. With the introduction of oxygenated fuels, carbon monoxide emissions are reduced by five percent per year through 1994.

"The central policy and public debates will be what are 'feasible' measures."

The central policy and public debates will be what are "feasible" measures? This simple question has multiple dimensions. What is **technically** feasible? **When** is something technically feasible? What is **financially** feasible? What is **institutionally** feasible? How **feasible** are multi-year commitments to **fund, monitor, and legally enforce**? Policy boards composed primarily of elected officials, will ultimately decide these questions. If some of the proposed measures prove to be infeasible or inefficient, alternatives may need to be developed.

Public comments are sought on all aspects of the **'91 CAP**. Are the measures feasible and reasonable? Do they attempt too much, too fast, or are the proposals too little too late? Is the public willing to do its part and possibly more? Are there impacts which have been neglected or improperly assessed?

Stationary Source Control Measures

Table 8 presents the proposed stationary source control measures. They cover many categories subject to existing regulations. Many of these regulations are to be tightened. Each control contributes a small but significant reduction to the overall program. Relative cost-effectiveness estimates are provided for each measure. Lastly, a projected start date for achieving emission reductions is given. The actual dates will depend on the rule making time table set up for each potential control measure. Assuming no major obstacles in setting up workshops, conducting public hearings, and working with affected groups, the regulations can be developed within the time frames identified.

In addition, a major modification to the BAAQMD permit program is being developed as this plan is being prepared. This "no net increase" program will require offsets, i.e. emission reductions, to balance any cumulative increases from new or modified stationary sources that receive permits. The revised permit program should be adopted by mid-1991 to satisfy the severe area and long range transport requirements. The "no net increase" program should reduce the emission growth rates in many stationary source sectors.

The proposed stationary source control measures are ranked by cost-effectiveness in Table 9. This ranking is required by the CCAA.

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
A.	**SURFACE COATING AND SOLVENT USE**							
A1	IMPROVED ARCHITECTURAL COATINGS RULE							
	(a) Lower VOC-limits for some specialty coatings	$2000	1.70 - 2.92	2000+	D	B	B	2000+
	(b) Eliminate small container exemption	$2000		9/97	D	B	B	95 - 97
A2	IMPROVED INDUSTRIAL MAINTENANCE COATINGS RULE							
	(a) Lower VOC-limits for some coatings	$2000	.74 - 1.16	2000+	D	A	B	2000+
A3	IMPROVED AEROSPACE COATINGS RULE							
	(a) Set transfer efficiency standards	savings	.37 - .55*	1/95	B	A	C	91 - 94
	(b) Lower VOC-limits for some specialty coatings	$2000		1/97	D	A	B	95 - 97
A4	IMPROVED WOOD FURNITURE AND CABINET COATINGS RULE							
	(a) Establish VOC-limits for coatings	$2000	5.94 - 6.69	7/92	C	B	B	91 - 94
	(b) Eliminate small user exemption	$2000		10/91	C	B	B	91 - 94
A5	IMPROVED SURFACE COATING OF MISC. METAL PARTS AND PRODUCTS RULE							
	(a) Set transfer efficiency standards	savings	.30 - .42*	7/94	B	A	C	91 - 94
	(b) Lower VOC-limits for some specialty coatings	$2000		1/96	D	A	B	95 - 97
A6	IMPROVED SURFACE COATING OF PLASTIC PARTS AND PRODUCTS RULE							
	(a) Set transfer efficiency standards	savings	.37 - .50*	7/94	B	A	C	91 - 94
	(b) Lower VOC-limits for some coatings	$2000		1/96	D	A	B	95 - 97
A7	IMPROVED CAN AND COIL COATING RULE							
	(a) Lower VOC-limits for some coatings	$2000	.54 - 1.1*	1/96	D	A	B	95 - 97
A8	IMPROVED MAGNET WIRE COATING OPERATIONS RULE							
	(a) Modify or eliminate exemptions	$2000	.12 - .15	1/97	C	A	B	95 - 97

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
A9	IMPROVED AUTOMOBILE ASSEMBLY COATING OPERATIONS RULE							
	(a) Require add-on controls on some coating operations	$19,000	1.04 - 1.47*	2000+	B	A	A	2000+
	(b) Lower VOC-limits for some coatings	$2000		2000+	D	A	B	2000+
A10	IMPROVED GENERAL SOLVENT AND SURFACE COATING RULE							
	(a) Establish VOC-limits for coatings	$2000	.26 - .39	1/94	B	A	B	91 - 94
	(b) Modify mass emission limits	unknown		1/94	B	A	B	91 - 94
A11	FURTHER CONTROL OF EMISSIONS FROM ADHESIVES USE							
	(a) Establish VOC-limits for adhesives	$2000	1.79 - 2.04	7/95	B	A	A	91 - 94
	(b) Set transfer efficiency standards	$2000		7/92	B	A	C	91 - 94
	(c) Set standards for cleanup operations	savings		1/92	B	A	C	91 - 94
A12	ELIMINATION OF COATINGS RULES ALTERNATIVE EMISSION CONTROL PLANS							
	(a) Eliminate or modify AECP provisions in Reg. 8 Rules	$2000	.21 - .43	7/95	C	A	A	91 - 94
A13	IMPROVED GRAPHIC ARTS PRINTING OPERATIONS RULE							
	(a) Lower VOC-limits for fountain solutions	unknown	.09 - .13*	7/94	B	A	A	91 - 94
	(b) Require automatic blanket wash for heat-set flexographic presses	savings		7/95	A	A	A	91 - 94
	(c) Lower VOC-limits for inks	$2000		7/95	C	A	A	91 - 94
	(d) Require enclosed doctor blades for flexographic presses	unknown		7/95	A	A	A	91 - 94
A14	IMPROVED COATINGS AND INK MANUFACTURING RULE							
	(a) Abate emissions from large mixing operations	$6000 (a-b)	.50 - .67*	1/99	B	A	C	98 - 2000
	(b) Eliminate the small manufacturer exemption			7/93	B	A	A	91 - 94
	(c) Require reduced emissions from vat cleaning	savings		7/93	B	A	C	91 - 94
A15	IMPROVED RESIN MANUFACTURING RULE							
	(a) Abate pellet extrusion and final product packaging	unknown	unknown	2000+	B	A	A	2000+

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
A16	IMPROVED SEMICONDUCTOR MANUFACTURING OPERATIONS RULE							
	(a) Abate emissions from positive photoresist operations	$4000 (a-b)	.11 - .12*	1/99	A	A	A	98 - 2000
	(b) Abate emissions from solvent cleaning performed with coating-type applicators			1/99	A	A	A	98 - 2000
A17	CONTROL OF EMISSIONS FROM HOUSEHOLD SOLVENT DISPOSAL							
	(a) Encourage Cities and Counties to adopt programs for proper disposal of VOC-containing household wastes	unknown	.36	7/98	B	B	D	98 - 2000
A18	SUBSTITUTE SOLVENTS USED FOR SURFACE PREPARATION/CLEANUP OF COATINGS							
	(a) Set VOC/volatility limits for surface preparation solvents	$1100 (a-b)	7.7 - 11.6	1/96	B	A	C	95 - 97
	(b) Set VOC/volatility limits for cleanup solvents			7/97	C	A	C	95 - 97
A19	ULTRA-LOW VOC COATINGS							
	(a) Set VOC-limits for some coatings based on Vernonia oil substitution and/or UV curable	unknown	21.7 - 22.9	2000+	D	B	A	2000+

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
B.	**FUELS/ORGANIC LIQUIDS STORAGE AND DISTRIBUTION**							
B1	CONTROL OF EMISSIONS FROM RAILCAR LOADING							
	(a) Require vapor recovery systems on railcar loading of organic liquids	$4000	.08*	7/99	B	A	C	98 - 2000
B2	IMPROVED STORAGE OF ORGANIC LIQUIDS RULE							
	(a) Adopt more stringent standards for cone roof tanks	$2000 (a-g)	1.3 - 1.6*	7/95	B	A	A	95 - 97
	(b) Lower or replace small tank exemption with a throughput exemption			7/95	B	A	A	95 - 97
	(c) Require better tank seals/more frequent seal inspections			7/92	A	A	C	91 - 94
	(d) Set tank color requirements			7/96	B	A	A	95 - 97
	(e) Require vapor recovery for certain tanks			7/96	B	A	A	95 - 97
	(f) Require compliance-based floating roof tank vapor recovery retrofit			1/98	B	A	A	95 - 97
	(g) Require emissions to be controlled during tank cleaning			7/93	A	A	B	91 - 94
B3	IMPROVED ORGANIC CHEMICAL TERMINALS AND BULK PLANTS RULE							
	(a) Reduce emission standard for non-gasoline bulk terminals and plants	savings	.17 - .26*	1/94	B	A	A	91 - 94
B4	FURTHER EMISSION REDUCTIONS FROM GASOLINE DELIVERY VEHICLES							
	(a) Increase stringency of gasoline cargo tank vapor recovery requirements	savings	.13 - .17	1/96	A	A	B	95 - 97
B5	LIMITATIONS ON MARINE VESSEL TANK PURGING							
	(a) Require control of ballasting and housekeeping emissions	$4200	.40 - .43	1/94	B	A	C	91 - 94
B6	CONTROL OF EMISSIONS FROM CLEANING-UP ORGANIC LIQUIDS							
	(a) Require control of emissions from cleaning storage tanks, vessels, and VOC spills	$42,000	.07	1/99	A	A	C	98 - 2000
B7	CONTROL OF EMISSIONS FROM PROPANE HANDLING							
	(a) Require propane tanks to be filled by pumping	unknown	.09 - .10	2000+	D	C	A	2000+
	(b) Ban uncontrolled venting during servicing	unknown		2000+	D	C	D	2000+

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
C.	**REFINERY AND CHEMICAL PLANT PROCESSES**							
C1	IMPROVED PRESSURE RELIEF VALVES AT REFINERIES AND CHEMICAL PLANTS RULE							
	(a) Require venting to abatement devices and/or rupture disks with tell-tale indicators	$10,000	.50 - .67*	1/94	A	A	B	91 - 94
C2	IMPROVED PUMP AND COMPRESSOR SEALS AT REFINERIES AND CHEMICAL PLANTS RULE							
	(a) Require leakless seals	$2000	1.04 - 1.15*	7/95	A	A	A	95 - 97
	(b) Adopt a more stringent leak definition			7/92	A	A	C	91 - 94
C3	IMPROVED VALVES AND FLANGES AT REFINERIES AND CHEMICAL PLANTS RULES							
	(a) Require leakless valves	$1000 (a-c)	2.51 - 3.41*	7/95	A	A	A	95 - 97
	(b) Improve inspection and maintenance requirements			7/92	A	A	C	91 - 94
	(c) Adopt a more stringent leak definition			7/92	A	A	C	91 - 94
C4	IMPROVED PROCESS VESSEL DEPRESSURIZATION RULE							
	(a) Improve depressurization standards	$1000	.10 - .12*	7/99	C	A	B	98 - 2000
	(b) Set blowdown sizing requirements	unknown		7/99	C	A	A	98 - 2000
C5	IMPROVED WASTEWATER (OIL-WATER) SEPARATORS RULE							
	(a) Remove small wastewater separator exemption	$1000	2.49 - 2.62*	7/98	B	A	A	98 - 2000
	(b) Require large units to be vented to abatement devices	$3000		1/98	B	A	A	95 - 97
C6	FURTHER CONTROL OF EMISSIONS FROM WASTEWATER TREATMENT AT REFINERIES							
	(a) Require treatment systems to be enclosed and abated or control wastewater stream	$10,000 (a-c)	1.80 - 1.90*	7/99	A	A	A	98 - 2000
	(b) Require covers for holding tanks, wastewater processing equipment			7/95	A	A	A	95 - 97
	(c) Require controls for hydrocarbon pond desludging			7/95	A	A	A	91 - 94
C7	CONTROL OF EMISSIONS FROM PETROLEUM REFINERY FLARES							
	(a) Increase the capacity of blowdown recovery	unknown	.32 (RHC)*	1/99	B	A	A	98 - 2000
	(b) Improve flare design and operating parameters	unknown	.21 (NOx)*	1/99	C	A	A	98 - 2000

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
D.	**COMBUSTION OF FUELS (NOx SOURCES)**							
D1	CONTROL OF EMISSIONS FROM NON-UTILITY RECIPROCATING ENGINES		(NOx)					
	(a) Adopt NOx controls similar to existing SCAQMD Rule 1110.1	$2000	6.87 - 8.69*	1/96	A	A	B	91 - 94
	(b) Adopt NOx controls similar to existing SCAQMD Rule 1110.2	$5200		1/2000	A	A	B	98 - 2000
D2	CONTROL OF EMISSIONS FROM STATIONARY GAS TURBINES		(NOx)					
	(a) Adopt NOx controls similar to existing SCAQMD Rule 1134	$7500	6.73 - 7.22*	1/97	A	B	B	91 - 94
D3	CONTROL OF EMISSIONS FROM ELECTRIC POWER GENERATING BOILERS		(NOx)					
	(a) Adopt NOx controls based on combustion modifications/low NOx burners	$4000	7.25 - 10.9*	1/98	A	B	B	91 - 94
	(b) Adopt NOx controls based on add-on flue gas controls	$9000		2000+	B	B	B	2000+
D4	CONTROL OF EMISS. FROM BOILERS STEAM GENERATORS AND PROCESS HEATERS							
	(a) Adopt NOx controls similar to existing SCAQMD Rule 1146		(NOx)					
	(1) Large Units (100 MMBTU/hr or larger)	$9000	22.7 - 31.8*	1/97	A	B	B	91 - 94
	(2) Smaller Units (less than 100 MMBTU/hr)			1/98	A	B	B	91 - 94
D5	CONTROL OF EMISSIONS FROM CEMENT PLANT KILNS		(NOx)					
	(a) Adopt NOx controls similar to existing SCAQMD Rule 1112	$1000	3.14 - 3.77*	1981	A	B	B	91 - 94
	(b) Adopt NOx controls requiring flue-gas treatment	$2000		2000+	A	B	B	2000+
D6	CONTROL OF EMISS. FROM GLASS MANUFACTURING PLANT MELTING FURNACES		(NOx)					
	(a) Adopt NOx controls similar to existing SCAQMD Rule 1117	$4000	2.79 - 3.41*	1/97	A	A	B	91 - 94
D7	CONTROL OF EMISSIONS FROM RESIDENTIAL WATER HEATING		(NOx)					
	(a) Set NOx standards for new residential and commercial water heaters	unknown	.33 - .49	1/96	A	C	C	91 - 94
D8	FURTHER EMISSION REDUCTIONS FROM RESIDENTIAL FURNACES		(NOx)					
	(a) Establish more stringent NOx standards for new residential furnaces	unknown	.05 - .08	1/96	B	C	C	91 - 94

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
E.	**OTHER INDUSTRIAL/COMMERCIAL PROCESSES**							
E1	CONTROL OF EMISSIONS FROM RUBBER PRODUCTS MANUFACTURING (a) Require abatement of RHC emissions from rubber product manufacturing operations	$6000	unknown	7/99	C	A	B	98 - 2000
E2	CONTROL OF EMISSIONS FROM ASPHALT CONCRETE PLANTS (a) Set RHC emission limits for asphalt plants	unknown	.02	2000+	D	A	B	2000+
E3	CONTROL OF EMISSIONS FROM COMMERCIAL CHARBROILING (a) Set RHC emission limits for commercial charbroilers	$25,000	1.50	2000+	B	B	A	2000+
E4	INCINERATOR EFFICIENCY REQUIREMENTS (a) Set incinerator efficiency standards in terms of org. carbon oxidized to carbon dioxide	unknown	.33*	1/99	B	A	C	98 - 2000
F.	**OTHER STATIONARY SOURCE CONTROL MEASURES**							
F1	IMPROVED NEW SOURCE REVIEW RULE (a) Adopt an NSR Rule that requires mitigation for all new/modified sources	unknown	1.14 (RHC) .53 (NOx)	7/91	B	B	A	91 - 94
F2	EMISSION MINIMIZATION MANAGEMENT PLAN (a) Market-based requiring no increase in emissions from major facilities	unknown	unknown	2000+	B	B	A	2000+
F3	PROMOTION OF ENERGY EFFICIENCY (a) Establish a goal of increasing energy efficiency	unknown	unknown	1/92	A	A	D	91 - 94
F4	ENHANCED ENFORCEMENT OF EXISTING DISTRICT REGULATIONS (a) Adopt a program to increase compliance with District regulations	unknown	unknown	7/95	A	A	C	91 - 94

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

ID#	Title of Control Measure	Cost Effectiveness $/Ton-Reduced	Emission Reduction Potential Tons/Day	Rate of Reduction Start Date	Technological Feasibility A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
G.	**INTERMITTENT TRANSPORTATION CONTROL MEASURES****							
G1	CITIZEN POSTPONEMENT OF DISCRETIONARY ACTIVITIES							
	(a) Encourage postponement of certain activities during forecast ozone excess days	no cost	7.3 - 14.8 (R) .50 - 1.0 (N)	7/92	B	C	D	91 - 94
G2	INDUSTRIAL POSTPONEMENT OF ACTIVITIES DURING FORECAST OZONE EXCESS DAYS							
	(a) Require postponement of certain industrial activities during forecast ozone excess days	unknown	3.7 - 4.2 (R) .11 - .12(N)	1/93	B	B	A	91 - 94
G3	OZONE EXCESS 'NO DRIVE DAYS' (VOLUNTARY)							
	(a) Adopt a program to discourage auto use during forecast ozone excess days	unknown	4.1 - 8.3 (R) 4.6 - 9.1 (N)	7/92	C	C	D	91 - 94
G4	OZONE EXCESS 'NO DRIVE DAYS' (MANDATORY)							
	(a) Require employer-based VMT reductions during forecast ozone excess days	unknown	7.1 - 14.2 (R) 8.0 - 16.0 (N)	7/2000	C	D	C	98 - 2000
H.	**MOTOR VEHICLES****							
H1	SMOKING VEHICLE PROGRAM							
	(a) Adopt a citizen complaint program for smoking vehicles	unknown	.07 (RHC) .19 (NOx)	1/95	A	A	D	95 - 97
H2	HIGH POLLUTING VEHICLE RETIREMENT PROGRAM							
	(a) Adopt a program for the purchase and destruction of old automobiles	unknown	.23 (RHC) .08 (NOx)	1/95	B	A	D	95 - 97
H3	REQUIREMENT FOR CLEAN FUEL VEHICLE FLEETS							
	(a) Require large fleet vehicle owners to purchase only clean-fueled vehicles	unknown	.43 (RHC) .13 (NOx)	7/95	A	A	C	95 - 97
H4	URBAN BUS SYSTEM ELECTRIFICATION							
	(a) Require electrification of high-use urban bus routes	unknown	.30 (RHC) 1.92 (NOx)	1/2000	A	A	A	98 - 2000

Table 8 • 1991 Clean Air Plan Proposed Stationary Source Control Measures

NOTES

Cost-Effectiveness is the estimated **average** value for all sources affected by the control measure.

Total Emission Reduction (ER) Potential is the highest annual summer-day emission reductions (of RHC, unless otherwise specified) projected for the entire control measure (i.e. all control options) for the period beginning in the first year of effectiveness through 1997. For measures with start dates between 1997 and 2000, the emission reductions for the first year of implementation are given. For control measures with a start date of "2000+", the emission reductions given are based on the projected emissions subject to control for the year 2000.

For control measures with emission reduction estimates denoted with an asterisk (*), up to 25 percent of the total emission reductions indicated may be made available to NSR permit applicants for offsetting emission increases from new/modified sources. These emission offsets would be made available as early compliance credits for facilities that meet the requirements of a control measure before the measure becomes effective.

Rate of Reduction is the anticipated date that the control measure will begin to provide emission reductions. A start date of "2000+" means the emission reductions are anticipated to occur after the year 2000.

Technological Feasibility, Public Acceptability, and Enforceability were graded on a scale of A through D, with an A being the highest rating and a D being the lowest.

** Additional control measures developed as part of BAAQMD rule development process

Table 9 • Proposed Stationary Source Control Measure Cost-Effectiveness Rankings

Cost Effectiveness	Control Measure Identification Number
Savings	A3(a) A5(a) A6(a) A11(c) A13(b) A14(c) B3 B4
No Costs	G1
$1000/ton	C3 C4(a) C5(a) D5(a)
$1100/ton	A18
$2000/ton	A1 A2 A3(b) A4 A5(b) A6(b) A7 A8 A9(b) A10(a) A11(a,b) A12 A13(c) B2 C2 D1(a) D5(b)
$3000/ton	C5(b)
$4000/ton	A16 B1 D3(a) D6
$4200/ton	B5
$5200/ton	D1(b)
$6000/ton	A14(a,b) E1
$7500/ton	D2
$9000/ton	D3(b) D4
$10,000/ton	C1 C6
$19,000/ton	A9(a)
$25,000/ton	E3
$42,000/ton	B6
Unknown	A10(b) A13(a,d) A15 A17 A19 B7 C4(b) C7 D7 D8 E2 E4 F1 F2 F3 F4 G2 G3 G4 H1 H2 H3 H4

Source: BAAQMD (1991)

Mobile Source Control Measures

In spite of numerous control efforts over several decades, motor vehicles continue to be a major air pollution problem. The federal and California motor vehicle emission control programs have reduced tailpipe emission rates for automobiles by about 90%. However, the sheer number of vehicles and rapidly growing use have offset some of this gain.

Figure 10 shows basic travel information for the Bay Area historically and projected into the near-term future. Relative to other urbanized California regions, such as Los Angeles, San Diego, Sacramento and even many Central Valley communities, the Bay Area's growth rates are the lowest.

"Contrary to public perceptions, the length of most trips is decreasing . . . VMT will increase by . . . the rate of population growth."

Between 1990 and 2010, vehicle trips are forecast to grow by 27 percent. Home to work trips will grow by 21 percent or only slightly more than the rate of population growth. Contrary to public perceptions, the length of most trips is decreasing. Over the next twenty years, the average trip will be 9 percent shorter, while the length of the home to work trip will decrease by 11 percent.

Following decades of rapid growth, the rate of miles driven will slow as well. From 1990 to 2010, the total Bay area vehicle miles traveled (VMT) will increase by 18%, less than one percent per year, and essentially the rate of population growth expected during the same time. Work related VMT will grow by 12 percent or less than the expected population increase.

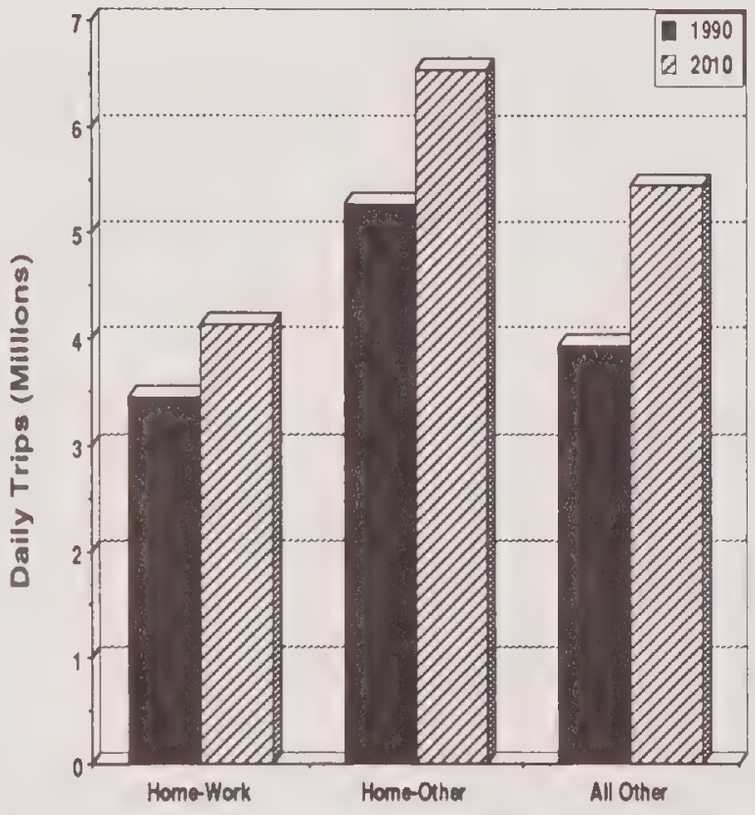
Due to cleaner new cars, motor vehicle emissions will continue to decrease in the Bay Area for the foreseeable future, as noted previously. To accelerate the projected decreases, the CARB has proposed a series of tougher standards for many vehicle classifications. Other programs will further reduce vehicle emissions.

As a severe non-attainment area, every feasible program proposed by the CARB is needed for the Bay Area. As part of the **'91 CAP**, this includes the following programs already adopted by the CARB since 1987:

- Regulations for low-emission vehicles and clean fuels, including transitional low-emission vehicles, low-emission vehicles, ultra-low-emission vehicles and zero emission vehicles. Fuels necessary for these vehicles must be provided as these vehicles are introduced into the fleet.
- Improved inspection/maintenance ("Smog Check") program;
- On-board diagnostic systems - Phase 2;
- Certification procedures for aftermarket catalytic converters;
- Revised in-use vehicle recall regulations;
- Amended emission control system warranty requirements and standardized nomenclature;
- Revised light-duty aftermarket parts program; and
- Heavy-duty vehicle (i.e. truck diesels) smoke enforcement program;

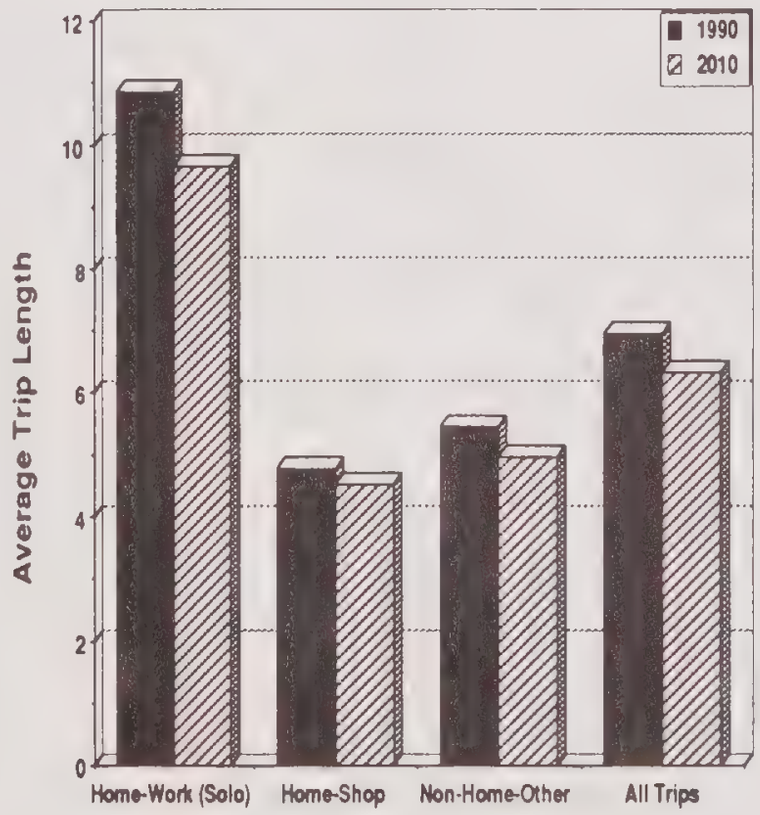
Figure 10 • Bay Area Vehicle Travel Characteristics: Trips, Trip Length, and VMT

1990 and 2010 Trips*



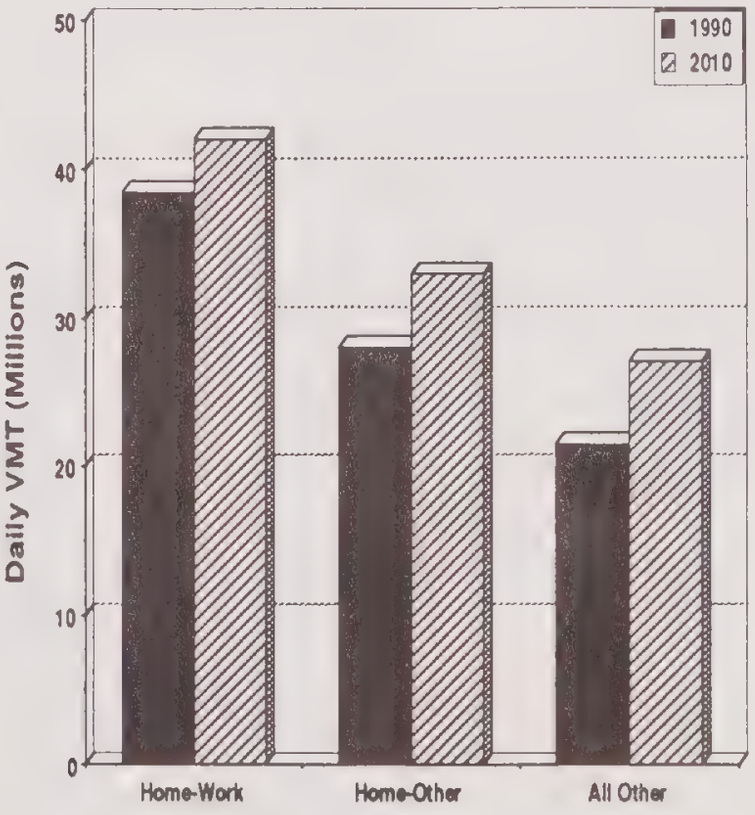
* 27% Growth Overall

Average Trip Length**



** 9% <u>Decrease</u> Overall

Vehicle Miles of Travel***



*** 18% Growth Overall

Source: MTC (October 1990)

In addition to the CARB regulations for low-emission vehicles and clean fuels, other more stringent standards for new and used vehicles are also being implemented:

- New direct import vehicle certification regulations;
- Used direct import vehicle certification regulations;
- Revised emission standards for gas and diesel-powered heavy-duty engines;
- 0.4 grams/mile NOx emission standard for light-duty vehicles;
- Lower HC and CO standards for light-duty vehicles;
- New diesel fuel quality standards;
- Revised emission standards and test procedures for medium-duty vehicles and light-heavy-duty engines; and
- Revised evaporative emission test procedure.

"Motor vehicle programs . . . intended for . . . implementation in the South Coast basin . . . should also be implemented in the Bay Area on the same schedule . . . only then can the region say it is carrying out all feasible measures."

The CARB is also developing a series of measures for regulatory consideration. During 1991 and 1992, the following measures appear to be feasible in some form:

- Enforcement of emission standards, especially for alternative fuel retrofit systems;
- Broader and tougher emission standards for new vehicles and engines, including utility engines, construction and farm equipment, off-road motorcycles, off-highway vehicles, and marine vessels; and
- New gasoline specifications - Phase 2.

These measures are all incorporated as part of the **'91 CAP**. A number of the programs described above are intended for early or initial implementation in the South Coast (or Los Angeles) basin. Because the Bay Area is a severe area, any measure being carried out in Southern California should also be implemented in the Bay Area on the same schedule. The Bay Area is the second most populous region of the State and needs to benefit from all possible technological improvements being achieved elsewhere. Only then can the region say it is carrying out all feasible measures.

Beyond the control measures noted above, the CARB staff is also studying a number of other proposals. Most likely, if technically feasible, these measures would be proposed as regulations after 1992 and be implemented some time after. The following measures are under review:

- Further enhancements to the improved "Smog Check" program;
- Inspection and maintenance for light-duty diesel vehicles;
- Inspections of fleet heavy-duty trucks;
- Heavy-duty bus particulate trap retrofits;
- Retrofit/operational requirements for trains;

- Control of off-cycle emissions;
- Low emission vehicle standards for heavy-duty engines;
- Fleet average standards for post-2003 model years low emission vehicles

This last set of proposals is **not** part of the **'91 CAP**. Certain of these measures may be considered or required for the federal Clean Air Act. They do illustrate, however, the ongoing potential of further reducing mobile source emissions from the various categories of vehicles in use. Part or all of these control measures may be included in the 1994 Clean Air Plan update.

Transportation Control Measures (TCMs)

The technical mobile source controls discussed above will reduce the per vehicle emissions for each mile driven. Measures which seek to reduce the total number of trips and miles traveled also need to be examined--transportation control measures (TCMs). For years, the Bay Area public has voiced concerns about traffic problems. Transportation problems are repeatedly surveyed as among the most serious issues to be dealt with. Growth, decentralizing job patterns, economic affluence, and sprawling land use developments have all contributed to the current traffic situation. Combined with federal and State funding reductions in recent years, money for transit improvements and alternative modes of transportation has been difficult to come by.

MTC has led the regional effort to develop a TCM component to the **'91 CAP**. The TCM plan has been refined over the course of more than a year with input from a broad cross section of Bay Area business, environmental, governmental and public interest groups. It is summarized in Figure 11. The plan is presented in three phases:

- Phase 1 - Reasonably Available TCMs that are based on existing authority and funding;
- Phase 2 - Additional Mobility, Traffic Operations and Incentive Package which requires new legislative authority and funding; and
- Phase 3 - Market Based TCMs which also require authorizing legislation, except parking management.

Phases 2 and 3 need the most effort to carry out. The programs entailed in these phases must have authorizing legislation, and in most cases, new financing mechanisms. Most elements will also need considerable public education efforts and consensus building to be successful.

Table 10 summarizes the emissions reductions anticipated from the TCM measures. Phase I is assumed to be implemented by 1994. Similarly, Phase II measures are scheduled for implementation by 1997. The Phase III market based strategies appear to be the most uncertain. These measures require additional legislative authority prior to implementation. The emissions reduction estimates shown assume all three phases are implemented by 2000. Estimates of the '91 CAP effectiveness shown previously in Table 6 incorporate the reductions shown above.

Sub-area CO Analysis

During the period 1987-1989, three sub-areas of the region exceeded CO air quality standards--San Francisco, San Jose and the

Figure 11 • TCM Plan: January 1991

Phase 1 — Reasonably Available TCMs
▲*Based on existing authority and funding*

Employer Based Trip Reduction
(TCMs 1, 2)
- Employer assistance programs
- Trip reduction rule

Indirect Source Review
(TCM 16)
- New development
- Existing development

Mobility [partially funded]
(TCMs 4, 7, 8, 9, 11)
- Rail extensions
- Ferry service
- HOV lanes
- Bicycle access
- Freeway TOS

Implementation Support
- Public education *(TCM 17)*
- Develop legislative package for Phase 2 revenue measures *(TCM 21)*
- General Plan - Air quality element *(TCM 19)*
- High density zones at transit stations *(TCM 18)*
- Monitoring

Phase 2 — Additional Mobility, Traffic Operations and Incentives Package
▲*Requires new legislative authority/funding*

Mobility Improvements
(TCMs 3-10)
- Areawide transit service improvements
- Expand new rail starts
- Improve access to rail systems
- Improve ferry service
- Inter-city rail
- HOV (carpool) lanes
- Bicycle improvements
- Students transportation

Traffic Operation Management
(TCMs 11, 12)
- Freeway incident management
- Arterial traffic management

User Incentives
(TCMs 13, 14, 15)
- Transit fare reduction
- Vanpool liability insurance
- Carpool subsidies/incentives

Implementation Support
- Expand public education *(TCM 17)*
- Revenue measures *(TCM 21)* [registration fees, gas tax, higher bridge toll]
- Demonstration programs *(TCM 20)*

Phase 3 — Market Based TCMs
▲*Requires authorizing legislation, except parking management*

Pricing Strategies
- Smog fee
- Gas tax increase
- Congestion pricing
- Toll roads
- Parking management
  - — Work parking charges
  - — Non-work parking charges

City of Vallejo. Statistical analysis of these areas for the three years results in "design values" or maximum expected air quality levels as shown:

Area	CO Design Value (ppm)	Emission Reductions to Meet Standard
San Francisco	10	10%
San Jose	12	25%
Vallejo	11.5	22%

Table 11 presents the CO rate of emission reductions for the three areas noted. Depending on local weather conditions and the schedule for implementing a regional oxygenated fuels program, all three nonattainment sub-areas are projected to meet the state CO standard within the next few years. San Francisco is the closest currently. Vallejo and San Jose are projected to meet the CO standard by the mid-90s.

Table 10 • Summary of TCM Plan Emissions Reductions

	Percent Change in			Emission Reductions Tons/Day		
	RHC	NOx	CO	RHC	NOx	CO
Phase I: Reasonably Available Measures and Federal TCMs by 1994	-4.8	-3.7	-5.1	8	9	119
Phase II: Mobility Improvements and Federal TCMs by 1997	-5.6	-5.4	-5.8	14	20	210
Phase III: Market-Based Measures (Implementation Date Uncertain)	-23.7	-14.8	-23.9	—	—	—
Net Results (Assumes Phases I, II, III by 2000)	**-31.4**	**-22.4**	**-32.0**	**35**	**45**	**515**

Table 11 • Sub-area CO Rate of Emission Reductions

	Baseline CO Inventory Projections Tons/Day			# Years From Baseyear	Target 5% Annual Reduction	Target CO Inventory Tons/Day			Projected CO Emissions With '91 CAP**** Tons/Day		
	SF*	SJ**	Vallejo***			SF	SJ	Vallejo	SF	SJ	Vallejo
1987 Baseyear	276	459	29.3	0	0	276	459	29.3	—	—	—
↑ '91 CAP ↓											
1994	193	334	22.8	7	35	179	298	19.1	161	279	19.0
1997	161	288	20.4	10	50	138	230	14.7	126	226	16.0

* City and County of San Francisco — 126.1 square kilometers (see Figure 12)

** Greater San Jose, including downtown — 522 square kilometers (see Figure 13)

*** City of Vallejo — 63.4 square kilometers (see Figure 14)

**** Assumes 12% CO emissions reductions by 1994 from implementing oxygenated fuels program, Phase I TCMs (by 1994), and Phase II TCMs (by 1997)

Figure 12 •San Francisco CO Sub-area

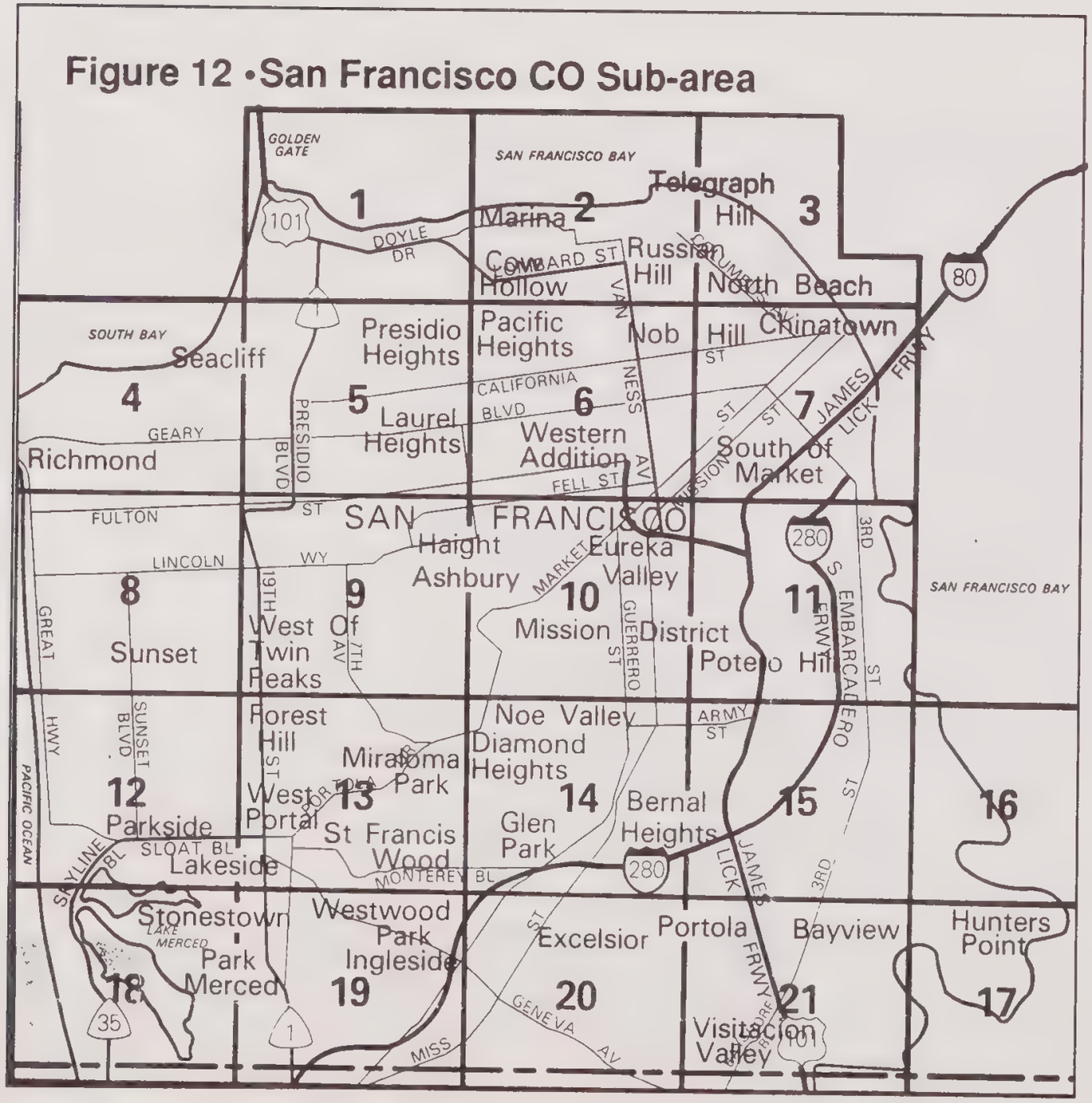


Figure 13 •San Jose CO Sub-area

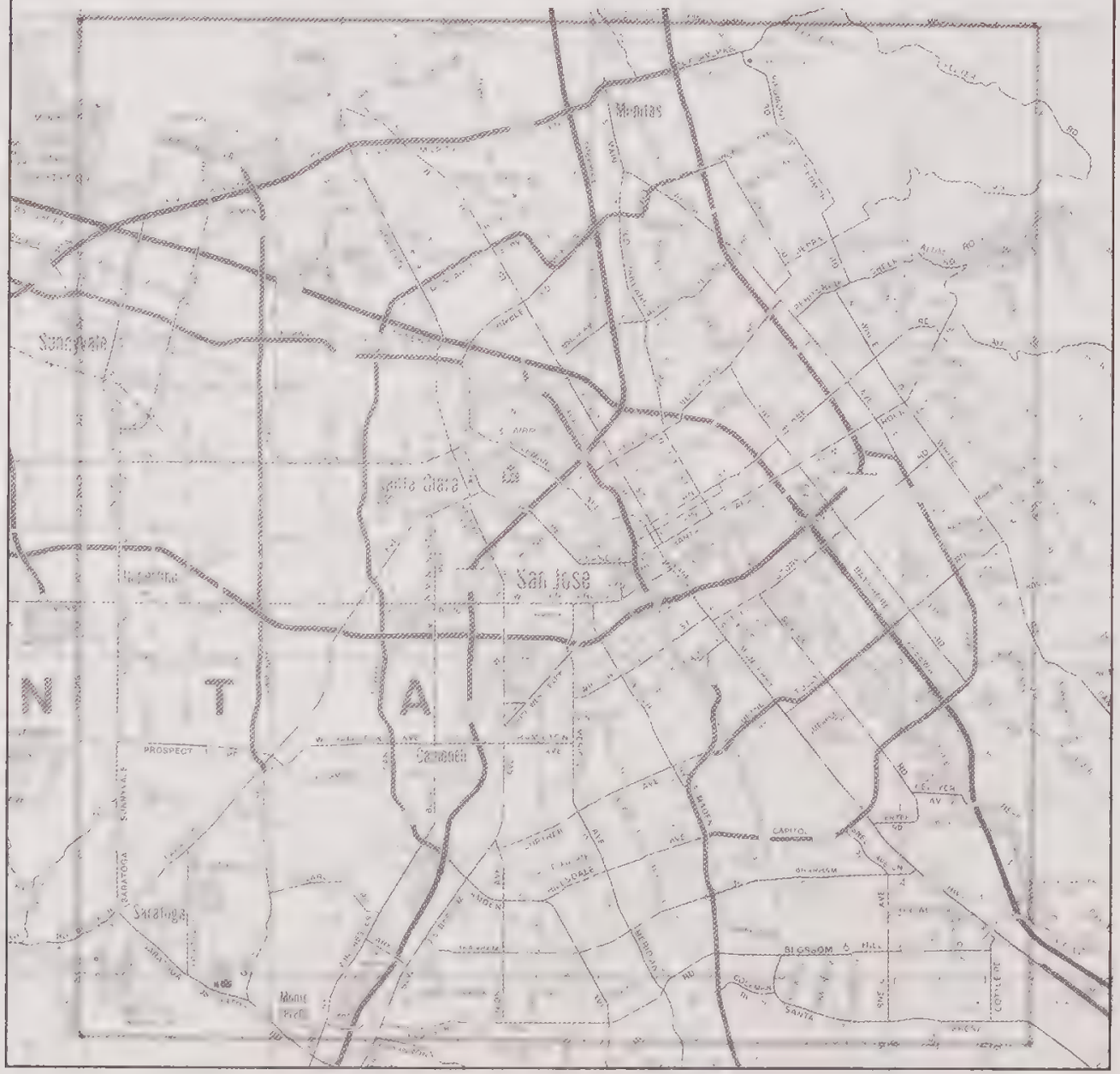


Figure 14 • Vallejo CO Sub-area

THE BENEFITS AND COSTS

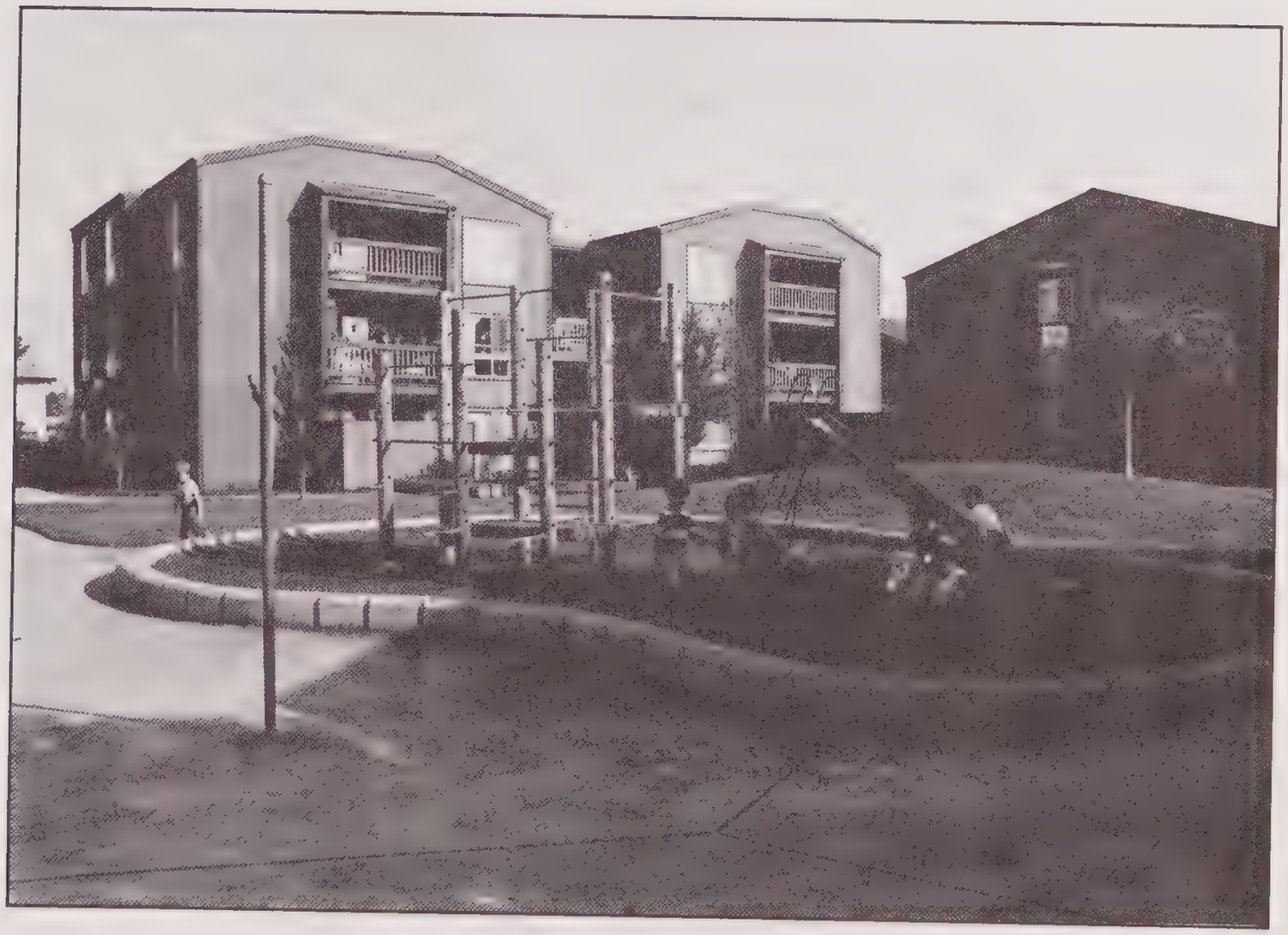
The direct primary benefits of the plan will be cleaner air. The law mandates it. Cleaner air will result in improved health for the region's citizens. This will reduce respiratory related illnesses, improve worker productivity, and lower medical costs. Other benefits of improved air quality will be enhanced visibility, reduced agricultural and materials damage, lower energy consumption, and improved traffic conditions.

"Cleaner air will result in improved health . . . the direct and indirect costs . . . are . . . substantial."

Most of these benefits are difficult to quantify with confidence. Considerable uncertainty exists in making such estimates. The benefits are substantial, however. Underlying these benefits is the public policy decision, as set forth in the California Clean Air Act, to guarantee the public's right to breathe healthy air as defined by State air quality standards.

The direct and indirect costs of the plan are also substantial. The direct Bay Area costs of carrying out the two previous federal plans beginning in 1979 has exceeded one billion dollars. In the late '70s, it was estimated reaching the federal ozone standard by 1987 would cost about $100 million annually. Implementing the current proposals will most likely exceed earlier costs for several reasons. First, inflation has increased the costs estimates of the late '70s by almost a factor of two. Second, technological controls for stationary and mobile sources have become less cost-effective over time; most of the easier and cheaper control measures have already been implemented. Lastly, the increased emphasis on transportation related measures will increase costs significantly. Many TCMs have large capital and operating costs associated with them, and emission reductions are modest. There will be mobility benefits and energy savings, but again, such benefits are difficult to quantify.

These factors are important in determining what is feasible and when. Again, public input is sought in providing information regarding benefits and costs of the **'91 CAP**.



OTHER ISSUES

Air quality policy issues affect other public policy decisions. They impact the regional economy, jobs, housing, energy, land use and transportation, and many other planning programs. Tradeoffs are often difficult to make. In some respects, the California Clean Air Act does not allow tradeoffs. It requires implementing all "feasible" measures.

"The information base needed to properly design an effective . . . (transport mitigation) program does not yet exist."

The **CAP '91** proposes a comprehensive series of control measures to further reduce air emissions throughout the Bay Area on an established schedule. It appears relatively straight forward. However, the Act is complex and a number of important policy issues are postponed for additional study in the future. Among these air quality policy issues are:

Transport Mitigation - The CCAA calls for upwind regions contributing to air quality violations in adjacent areas to "mitigate" such impacts with additional control programs. The requirements are simple and logical, but they are extremely difficult to deal with in practice. Most of the difficulties are scientific and technical. The information base needed to properly design an effective and discriminating mitigation program does not yet exist.

At different times of the year, Bay Area winds carry pollutants into the Sacramento region, Central Valley, and the Monterey Bay. The converse is also true. Accurate estimates of how much pollution is transported and the extent to which these transported emissions aggravate local problems are not available. Studies are being conducted now in the Central Valley to improve our understanding of the transport issues between the Bay Area and several adjoining counties.

In the interim, some special considerations to deal with transport mitigation are recommended. If the Bay Area significantly reduces emissions within the region and improves its air quality, by definition, fewer pollutants will be around to be transported downwind. If the Bay Area's air quality steadily improves over time, adjacent regions will be impacted commensurately less from our emissions.

CARB regulations for transport mitigation adopted August 10, 1990 set forth three requirements to be met:

- Accelerate implementation of a "no net increase" permit rule for new stationary sources to prevent additional pollutant growth; such a rule is to be in effect by June 30, 1991;

- Implement "best available retrofit control technology" (BARCT) on sources representing 75% of the ozone precursor inventory;

- Carry out measures to attain ozone standards in San Benito County on transport days.

These mitigation transport requirements will be met by the '91 **CAP** and subsequent programs.

Hydrocarbon and Nitrogen Oxides Controls - Previous Bay Area plans have advocated a hydrocarbon only control strategy to improve ozone levels. The foundation for this approach was the computer modeling completed in the late '70s and early '80s. Air quality models, such as the ones used in this plan, are continually being refined and improved. Significant improvements are incorporated into the models presently being used. The latest

computer simulations with improved models and better input data suggest both hydrocarbon and nitrogen oxides controls will improve ozone air quality.

These results still show that reducing hydrocarbons only is the preferred way to improve ozone air quality. Nitrogen oxides emission reductions tend to reduce **average** ozone, but produce local ozone hot spots. As part of currently adopted programs, NOx will be reduced in motor vehicles and stationary sources, yielding overall ozone benefits and reduced particulate nitrates. Simultaneous reactive hydrocarbon emission reductions will minimize the hot spot effects. The five percent per year emissions reduction requirement of the CCAA applies to **both** precursor emissions.

Alternative Indicators - The CCAA allows regions to develop control plans using alternative indicators of progress. To do so, the plans must identify an index or statistic to show air quality improvements will occur faster than achievable through a five percent per year emissions reduction approach. For example, air quality indices are a possible alternative indicator. However, committees organized by CARB have not succeeded in identifying any alternative indicators acceptable to CARB. The greatest difficulty has been dealing with the enormous year to year changes in weather and meteorology. Direct air quality measurements vary considerably due to these factors, which tend to mask short-term trends.

Alternative Strategies - The CCAA also allows districts to use an alternative emission reduction strategy if it can be shown to be equally or more effective than the 5 percent per year requirements. Planning and modeling efforts to date have not identified any practical strategy that would be more effective. This option remains open for future work.

Contingency Measures - The CCAA requires plans contain "contingency measures to be implemented upon a finding by the state board...that the district is failing to achieve interim goals or maintain adequate progress toward attainment." The draft **'91 CAP** proposes many measures potentially affecting many people, businesses, industry, and public agencies. As the plan is reviewed, it will be refined. Some measures may be added and others deleted. During this review process, measures that are appropriate for consideration as contingency measures will be developed.

Federal Clean Air Amendments of 1990 - The recent amendments to the federal Clean Air Act build upon the 1970 and 1977 Acts. State implementation plans (SIPs) are required showing how federal air quality standards will be met. Regions are similarly classified according to the severity of their air quality problems. Areas with the worst problems are expected to carry out the most stringent control programs. New time tables are given for areas to meet the standards. Many of the federal and State requirements are roughly equivalent. In other areas, important distinctions exist.

Overall, the requirements of the California Clean Air Act are considerably more stringent. Programs carried out to meet the CCAA will be more than sufficient to meet the federal Clean Air Act. Three possible exceptions are that federal law requires:

- Oxygenated fuels for **all** CO nonattainment areas, including the Bay area;
- Enhanced I & M, equivalent in effectiveness to an annual, centralized program; and
- Future controls for many toxic substances.

Federal guidance for air quality plans due under the latest amendments is currently being developed. State implementation plan revisions are due in 1992-1993. Preparation of this plan update for the Bay Area will build heavily upon the proposals contained in the **'91 CAP**.

Other Pollutants - The CCAA requires submittal of plans in 1991 to control CO and ozone. This **'91 CAP** addresses these two pollutants. There are a number of other air quality concerns in the Bay area. Two additional problem areas are particulate matter (or PM-10) and toxic air pollutants. The latter are substances known to be carcinogenic or otherwise harmful, but for which ambient air quality standards have not been set.

Implementing the **'91 CAP** will reduce the emissions and health impacts of both PM-10 and toxics. For example, measures which reduce gasoline emissions will also reduce the toxic chemical benzene, a component of gasoline. Similarly, NOx reductions will reduce the nitrate component of PM-10. Reduced wood burning will lower CO, PM-10, toxic compounds, smoke, and odor problems. TCMs that reduce vehicle travel thereby also eliminate RHC, NOx, CO, toxics, PM-10, and ozone. The BAAQMD has active and independent programs to address PM-10 and toxics outside of the **'91 CAP** planning process.

"Despite the large technical uncertainties, the region has never overcontrolled."

Energy Issues - Some air pollution controls, for example use of afterburners, require additional energy consumption. The major impact of this Plan, however, will be energy conservation. Since transportation is the largest sector in California's energy budget, implementation of TCMs will reduce energy demands.

Global Issues - TCMs, along with combustion and evaporative controls on many sources will reduce emissions of carbon dioxide, methane and other greenhouse gases. Global warming and stratospheric ozone are important issues which should benefit from carrying out the proposals in this Plan.

Technical Uncertainty - All air quality plans require extensive scientific and engineering judgements. Uncertainties abound in the emission inventory, modeling, projections, control effectiveness, and cost estimates. At any given time, the best available information is used to develop the plan. Estimates made in this plan are better than those in the 1982 plan, which in turn are better than estimates made in the 1979 plan. The uncertainties will always exist; by their nature they can never be eliminated. By updating plans regularly, monitoring improvement progress and revising earlier projections, technical uncertainties can be managed and dealt with.

Air quality plans have been prepared for the Bay Area since the early '70s. In each update, the technical basis of the plan has improved. More information is available for each planning effort. Longer trends are monitored. Projections are refined. All the Bay Area air quality plans share one trait: the earlier plans have all **undercontrolled** emissions compared to what was necessary to meet air quality goals. Despite the large technical uncertainties, the region has never **overcontrolled.**

The **'91 CAP** projects improved air quality. An excellent chance exists to meet the CO standard by the mid-90s. In any event, CO levels will be significantly lower than today and the number of violations fewer. Ozone levels will also improve. Doing everything feasible, however, will not meet the standards by 1997, and most likely not in the foreseeable future. Again, the severity and

number of ozone violations will decrease through this decade.

NEXT STEPS

"Air quality improvements require the participation of all the region's residents . . . the measures contained in this plan will effect us all."

Your review and input regarding this draft plan is important. The draft **CAP '91** is scheduled for a series of informational meetings and public hearings. Air quality improvements require the participation of all the region's residents. Costs for technological improvements will be borne by all consumers. New cars, appliances, and cleaner products will cost more. Services provided by companies with new or tighter controls will cost more. Citizens are being asked to change how they live and drive. Decisions about consumer products and urban activities need to be planned to minimize their air pollution impacts.

The measures contained in this plan will affect us all. Many questions need to be answered before the plan is adopted and can be implemented. Are the control measures achievable? Are they feasible? Are they desirable? Are the costs and impacts acceptable? Who should pay? Are there other ways--perhaps better ways--to achieve the same results? Are the measures fair? Can the programs be carried out easily and who should carry them out? How can voluntary programs be made effective?

Several workshops and hearings were held in 1990 by MTC during development of the TCM portion of this plan. More comment opportunities are planned during 1991 for the entire **'91 CAP**. The following meetings provide opportunities to receive your inputs about the plan:

ABAG policymakers will be briefed on the **Draft '91 CAP** at its April 18th Executive Board and May 1st Regional Planning Committee meeting. Public comments at both meetings will be welcome. The exact time, location, and agenda for these meetings can be received by calling the ABAG offices at (415) 464-7900.

The BAAQMD will hold informational meetings on the **Draft '91 CAP** in late April and early May. These meetings will be held at various locations around the Bay Area. Dates and locations will be announced. For further information, please call BAAQMD at (415) 771-6000.

An environmental impact report (EIR) on the **'91 CAP** is being prepared. The draft environmental impact report (DEIR) should be available to the public in June, 1991. In accordance with the California Environmental Quality Act (CEQA), there will be a public comment period and a final EIR which includes responses to comments. BAAQMD will be the lead agency for the EIR process. The **'91 CAP** will be adopted formally after the final EIR is certified.

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